



Draft Technical Memorandum

To: Mitigation Working Group - City of Austin
From: Paul Walker - Carollo Engineers
Date: April 10, 2007
WO #: 6460G.00
Subject: Environmental Commissioning Checklist Guidance Document
Prepared By: Paul Walker, P.E.

1.1 OVERVIEW

The Environmental Commissioning (EC) Process is intended to be a collaborative effort between the Design Team and the EC Agent and staff working in a "proactive participation" mode to achieve the following goals for the project:

- A WTP that achieves operational requirements and is completed on-time and on-budget
- Protection of environmental resources in the vicinity of the WTP

The EC Checklist will serve to guide both the Design Team and the EC Agent's team through the preliminary design, design, construction, start-up, and operations of Water Treatment Plant No. 4 (WTP 4). The EC Checklist will be used to help implement the goals and recommendations set forth for the project in the report titled "Water Treatment Plant 4 Environmental Goals & Recommendations for Mitigation, Best Management Principals, Monitoring, and Environmental Commissioning" (October 2005). Through the EC Checklist process, the following guiding principals should also be considered in the overall design of the facilities to help achieve the environmental goals established for the project.

1. Thoughtfully consider effects; don't assume no effects
2. Consider sustainable alternatives
3. Avoid or minimize site excavation when practical. In general, fill is preferable to cut.
4. Minimize chemical usage during construction and operations
5. Minimize impervious surfaces
6. Promote natural infiltration where feasible and appropriate
7. Preserve or mimic groundwater and surface water hydrologic regimes
8. Look for resource re-use or conservation opportunities



9. Strive for energy efficiency
10. Consider non-standard or accidental operations, assume that "what can go wrong, will"
11. Where feasible, minimize or eliminate the emission of noise, dust, light, chemicals, sediment, liquids, solids, gases, etc. from the site

The EC Checklist should address the following:

- **Project Components:** The project will be divided into components on a facility-by-facility basis. Each facility will be examined individually to estimate potential effects on the environment and to develop methods for mitigating effects. Effects should be considered for the construction phase and operation phase of the project. A separate checklist will be prepared for each facility. In addition, another checklist will be prepared for the entire site to evaluate the cumulative effects of all the facilities and to identify potential effects and mitigation measures not attributable to the individual facilities.
- **Documentation:** Documenting the information along with assumptions and decisions made will be critical for the success of the EC Process. The EC Checklist will serve as an outline and table of contents for folders that will be prepared for each facility. Each folder will include information on layouts, design criteria, assumptions, materials to be used during construction and operations, possible spill/release mechanisms, the effects of possible releases of those materials, documentation as to the effects on the surrounding environment, decisions, environmental controls, and other documentation as necessary to fully describe the process used to develop the recommended facilities.
- **Collaboration:** The EC Checklist formalizes the interaction between the Design Team and the EC Agent by implementing a series of milestones, or checkpoints, where the two groups meet and develop approaches for achieving the project goals. Breaking the process down into a formal checklist allows for a systematic approach for addressing both environmental and WTP facility issues and requirements. The process also allows the work to progress in a logical sequence whereby decisions are made when needed so that the next phase of work can begin without the need to revisit previous decisions and actions taken.

1.2 CHECKLIST INSTRUCTIONS

- 1) **Updating:** The Design Team Facility Lead is responsible for keeping the EC Checklist and associated documentation current until it is completed by the Design Team. Once the Design Team is done with the EC Checklist, then the EC Agent will be responsible for the approval and monitoring of the checklist. The documents will be reviewed on a regular basis by the Design Team Project Managers and the EC Agent.
- 2) Each Checklist shall be reviewed regularly with the EC Agent for completeness and content, and a completed checklist shall be issued for review by the EC Agent. Comments received from the EC Agent on the completed checklist shall be addressed as applicable and a final checklist issued. If the Design Team Facility Lead and the EC Agent cannot agree on the checklist modifications, then the issue resolution process will be implemented.
- 3) **Documentation:** Each checklist should be accompanied by notes that document discussions and decisions made relative to the EC process. An EC folder will be created and maintained for each facility. The folder will serve to document the process used to design and commission each facility and the decisions made relative to that facility. A hard copy of each folder will be maintained by the EC Agent, and a virtual folder will be maintained on ProjectWise[®]. The EC



Checklist will serve as the table of contents for each folder, which will be subdivided into sections corresponding to each task in the EC Process (i.e., task P1 through P23 for the Preliminary Design Phase). Items to be included within each section include meeting minutes, agendas, documentation of correspondence, decision logs, and submittal information.

- 4) Specific Instructions: The following instructions are specific to the individual tasks in the checklist process:
 - a) P1: Before beginning design related tasks for a facility, the Design Team Lead shall review the goals and requirements from the report titled "Environmental Goals & Recommendations for Mitigation, Best Management Practices, Monitoring, and Environmental Commissioning" (October 2005) with the Project Team. The goals and requirements shall be summarized and developed into design criteria as applicable.
 - b) P2: Prepare a general description of the facility including design criteria, functions, layouts, phasing requirements, etc. The description must include a general description of the facility and its functions directed towards an audience of professionals not directly involved with the project. The process of developing the facility description includes review and acceptance by the Water Utility Core Team, Project Managers, Design Team Quality Management personnel, and Subconsultants.
 - c) P3: Summarize materials of construction and environmental information (a-f) for use in developing recommendations for environmental controls. Include materials that have potential to emit or discharge noise, dust, light, volatile chemicals, spills, sediment, liquids, solids, gases, etc.
 - d) P4: Design codes to be followed during the detailed design criteria shall be summarized here (Note: detailed code requirements will be developed during the final design phase). These may include the following:
 - i) City of Austin Land Development Codes
 - ii) TCEQ Edwards Rules, TPDES, and any other TCEQ design criteria
 - iii) International Building, Mechanical, and Plumbing Codes
 - iv) National Electric Code
 - v) EPA
 - vi) Others as applicable
 - e) P5: Review the Permit Technical Memorandum to determine specific permitting requirements that apply to this facility. Summarize permit requirements.
 - f) P6: Identify potential exceptions to environmental regulations (local, state, federal) that could be necessary for construction of the facility. For example, will the City's cut and fill limitation of eight feet need to be exceeded?
 - g) P7: Review the LEED checklist with the Design Team architect and Project Managers to determine what, if any, requirements apply to this facility. Summarize LEED components that are intended to be implemented for the facility. (NOTE: LEED design is not directly part of the EC Process, but decisions made relative to LEED design can have a potential influence on the EC Process.)
 - h) P8: Develop an initial listing of the potential effects that construction of this facility, considering both normal and accidental or non-standard operations (e.g., spills and unauthorized releases), could have on the surrounding environment. Review the "Guiding Principals" (above) and the Mitigation Plan for applicability to this facility.



- i) P9: Similar to P8, Develop an initial listing of the potential effects that the operation of this facility, considering both normal and accidental or non-standard operations (e.g., spills and unauthorized releases) could have on the surrounding environment. Review the "Guiding Principals" (above) and the Mitigation Plan for applicability to this facility.
- j) P10: Identify situations or specific elements of the facility where operational efficiencies could potentially be implemented. Examples include specifying higher efficiency pumps or motors for certain applications, considering two levels of lighting in certain areas to minimize energy used for lighting, and using common wall construction where feasible.
- k) P11: Upon completion of Tasks P1 through P10, the information generated will be submitted to Design Team Quality Management (QM) lead and Project Managers for review. Upon acceptance, the documentation shall be forwarded as a draft work in progress to the EC agent for review.
- l) P12: Schedule and conduct a workshop with the EC Agent and associated EC personnel to review the preliminary design information, discuss ideas, refine environmental goals as needed, discuss issues, and identify Best Management Practices (BMPs) and environmental controls.
- m) P13: Minutes shall be prepared for the workshop conducted under P12: The minutes will serve to document decisions made and any modifications that could be implemented for the facility design. The minutes will be issued in draft form for review and acceptance by the EC Agent. The Issue Resolution Process shall be implemented at this point in the process when the Design Team and the EC Agent/staff cannot achieve resolution on certain issues.
- n) P14: Document and develop any refinements, modifications, or new environmental goals identified through Tasks P12 and P13.
- o) P15: Document and develop any refinements, modifications, or new BMPs identified through Tasks P12 and P13.
- p) P16: Document and develop any refinements, modifications, or new adaptive management techniques identified through Tasks P12 and P13.
- q) P17: Update the information (drawings, design criteria, etc) developed under tasks P2 through P10 based on decisions made and accepted through P12 and P13 and the requirements specified in Tasks P14 through P16. The information generated will be submitted to Design Team Quality Management (QM) lead and Project Managers for review. Upon acceptance, the documentation shall be forwarded as a draft work in progress to the EC agent for review. (Note: In some instances, this information may be included as part of the draft Technical Memorandum (TM) issued for the facility under step P22 below. This should be confirmed with the EC Agent).
- r) P18: Schedule and conduct a workshop with the EC Agent and associated EC personnel to review the revised design information, discuss ideas, finalize environmental goals, Best Management Practices (BMPs), and environmental controls. During this workshop, review the minutes from P12 to determine whether all previously identified issues have been addressed. Note: In some instances, this workshop may be held in conjunction with the workshop for the draft TM review under step P23 below. This should be confirmed with the EC Agent).
- s) P19: Minutes shall be prepared for the workshop conducted under P18: The minutes will serve to document decisions made and any modifications that could be implemented for the facility design. The minutes will be issued in draft form for review and acceptance by the EC Agent. The Issue Resolution Process shall be implemented at this point in the



process when the Design Team and the EC Agent/staff cannot achieve resolution on certain issues.

- t) P20: Prepare draft Technical Memorandum (TM) for facility. TM to be reviewed by Design Team QM Lead and Project Managers.
- u) P21: TM to be issued as part of Preliminary Design draft report.
- v) P22: Conduct final workshop with EC Agent/staff, City personnel, peer review team, and subconsultants to review preliminary design, discuss any outstanding issues, and collect comments for finalizing the report.
- w) P23: As applicable, update the TM based on comments received at final workshop and issue as part of final report.

1.3 ISSUE RESOLUTION

One of the intents of the EC Checklist process is to resolve issues at the working level of the Design Team and the EC Agent's Team. When an issue cannot be resolved at the working level, a representative of either the EC Agent or the Design Team can request that it be elevated to the level of the EC Team. The EC Team is comprised of representatives from the Design Team, the Austin Water Utility, Watershed Protection and Development Review, and the EC Agent. If the EC Team cannot resolve the issue, then it can be escalated to the level of City Management for a final decision.

A goal for the EC process is to resolve issues at the working level and only escalate issues that have the potential to significantly affect cost, schedule, or the ability to achieve the goals established for the project. A rule of thumb is that at least 80 percent of issues are resolved at the working level, up to 15 percent are resolved at the EC Team level, and less than 5 percent require escalation to the level of City Management.



Environmental Commissioning Checklist

Facility ID: _____

Design Team
Facility Lead: _____

Refer to the Environmental Checklist Process Guidance Manual on the use and application of this Checklist. The Design Team Facility Lead is responsible for completing the tasks in the following checklist, initialing the checklist when a task is completed, and reviewing the checklist with the Environmental Commissioning (EC) agent at least monthly. The EC Agent is responsible for reviewing the checklist with the Design Team Facility Lead, participating in key activities where required, and initialing when an EC-related task is complete. The current version of this document, complete with attachments, shall be posted to ProjectWise®, and the original copy with attachments shall be stored in the project files in the Design Center. Where requirements do not apply to this facility, enter "NA."

PRELIMINARY DESIGN PHASE	Design Lead	EC Agent
P1. Review overall goals, BMPs, Monitoring, and Environmental Commissioning (EC) for facility (October 2005 report) w/ Project Team		
P2. Prepare general facility description (~ dimensions, preliminary criteria, size, function, components, phasing, etc)		
P3. Summarize Materials of Construction		
a. determine the products that may affect the environment that could be used for facility		
b. estimate the quantity to be onsite		
c. review and catalog MSDS sheets for products		
d. list toxic ingredients and potential discharge concentrations		
e. effects on local species or type		
f. reference for specific effects		
P4. List applicable design code(s)		
P5. Determine permit requirements that apply to facility		
P6. Identify potential exceptions		
P7. Determine if LEED applies to facility, summarize how it applies (review with Architect, see LEED checklist)		



P8. Review Guiding Principals and Mitigation Plan. Summarize potential effects during construction of facility to the following:		
Stream Water Quality and Quantity		
Stream Hydrology		
Groundwater Quality and Quantity		
Groundwater Hydrology		
Underground features (caves, voids, fissures)		
Air Quality		
Noise		
Light		
Flora		
Birds, cave invertebrates, salamanders, aquatic invertebrates, etc.		
P9. Review Guiding Principles and summarize potential effects from operation of facility to the following:		
Stream Water Quality and Quantity		
Stream Hydrology		
Groundwater Quality and Quantity		
Groundwater Hydrology		
Underground features (caves, voids, fissures)		
Air Quality		
Noise		
Light		
Flora		
Birds, cave invertebrates, salamanders, aquatic invertebrates, etc.		
P10. Identify opportunities for operational efficiencies		
P11. Submit items P2-P10 to EC Agent for review		
P12. Meet with EC Agent to review comments, develop goals, discuss issues, identify BMPs and controls		
P13: Prepare and issue minutes and decision log from Workshop		
P14. Summarize specific environmental goals for facility		



P15. Summarize BMPs and controls for facility		
P16. Identify adaptive management opportunities for facility		
P17. Update items P2-P10 per meeting and tasks P14 through P16 and submit to EC Agent for review		
P18. Meet with EC Agent to review and finalize goals, BMPs, controls		
P19: Prepare and issue minutes and decision log from Workshop		
P20. Prepare draft Technical Memorandum (TM) for facility		
P21. Issue draft TM as part of draft Preliminary Design Report		
P22. Conduct workshop w/ City, Design Team, & EC Agent to review draft report		
P23. Finalize and issue TM as part of Pre-Design Report		

Note: shaded cells require no action.



WATER TREATMENT PLANT 4 PROJECT

Status Report

March 2007

This report summarizes key issues and activities recently completed for the Water Treatment Plant 4 (WTP 4) Project and presents upcoming tasks to be completed.

Issue Resolution

The following list highlights key issues addressed through the Environmental Commissioning (EC) process for the WTP 4 Project.

Issue	Resolution
Review EC costs.	Time and cost estimates for EC work (consultant, WPDRD monitoring, project management) were carefully reviewed for efficiency and effectiveness. EC consultant cost estimate was reduced from \$5.75 million to \$3.4 million. Monitoring costs were reduced from \$3.4 million to \$2.1 million. Total EC cost estimate was reduced from \$11.9 million to \$7.4 million.
Design permanent and/or temporary stormwater controls to prevent sediment discharge during construction and provide best management approach during operation.	Design is underway with design consultants, WPDRD Review and Water Quality Engineering staff collaborating on designs.
Environmental Commissioning (EC) RFQ scope and conflict of interest.	RFQ was withdrawn in February and re-issued in March. LEED, efficiency related, and construction phase work was removed or reduced and conflict of interest provisions clarified.
EC Checklist to assist design staff in identifying key facility and treatment process environmental issues.	Several meetings held to finalize checklist and ensure that it is well understood and user friendly.
Draft Lime Residuals Technical Memorandum TM .	WPDRD staff reviewed and provided comments to design team on TM evaluating options for water softening and managing lime residuals disposal or reuse. Final TM is pending.
Facility layout and environmental protection.	WPDRD setup workshop to be held in April with Conservation Design expert Randall Arendt to develop facility layout that addresses technical, engineering, and environmental constraints.
Stormwater monitoring.	Installation of stormwater monitoring equipment was completed and should be operational for April.

Schedule

Preliminary design is underway and detailed design is scheduled to begin in the second half of 2007. The project is currently on schedule to meet the startup deadline of Summer 2013.

The EC RFQ was reissued in March and submittals are due April 23. Review of submittals should be completed in May with a recommendation to go to Council for approval on June 7 or earlier. It is hoped the EC agent will be under contract and prepared to begin work by the first week of July.

The initial construction will be for the permanent storm water ponds for the project. Design on these controls is underway. Anticipated construction on this phase of the project is for work to begin in October 2007 (after bird nesting season).

Environmental Commissioning

Recent Activities

- The Mitigation Working Group, comprised of representatives from Austin Water Utility (AWU), Watershed Protection and Development Review (WPDRD), Public Works (PU), and others has been meeting regularly since July 2006 to implement the Environmental Commissioning process for WTP 4. This group continues to meet to discuss global project issues.
- The Environmental Commissioning Team began meeting regularly to discuss and address environmental issues per the defined EC process.
- Surface water and salamander monitoring began in December 2006 as part of the effort to define baseline environmental conditions.
 - Mark and recapture was the focus of the March 2007 salamander monitoring effort.
 - Surface water monitoring staff assessed water chemistry at 3 sites and initial stream habitat assessments were completed.
- WPDRD staff monitored the geotechnical borings, which were completed on the plant property. Data will be available in April. All drilling fluid was lost in each hole due to karst geology. However, as a result of the EC process water from Bull Creek was used as a drilling fluid and no bentonite or other additives were used in the fluid.
- The initial dye tracing results began to be received in March. Only 1 site showed a very small amount of dye. After receiving the remaining data, staff will determine whether additional tracing efforts are needed.
- Negotiations began with RMT, Inc. to begin development of threshold toxic effects levels for the salamander and bird species of concern. Because this information is likely to be needed before the EC consultant will be under contract in July, RMT is being asked to provide this work in the meantime.
- In late March consultants to the design group found *Rhadine persephone*, the Tooth Cave ground beetle, in a Critical Environmental Feature (CEF) on the plant site. The city will be working with the US Fish & Wildlife Service to protect the habitat for the beetle.

Upcoming Activities

- Hold facility layout workshop on April 17 with key design and EC staff.
- Surface water and salamander baseline monitoring will continue in the Bull Creek watershed.

- Additional EC training and education will be implemented as additional staff, consultants, and contractors become engaged in the project.

Engineering

Recent Activities

- Site work for Geotechnical Investigations have been completed on the Bull Creek Site
- Site work for Geotechnical Investigations have been completed on the Raw Water Line from the Intake to the Bull Creek Site
- CEF feature locations have been surveyed and tied to the WTP 4 site coordinate system.
- WTP layouts are being revised at the Bull Creek site.
- Conducted three process equipment "lessons learned" session on the design of the current Ullrich WTP project.

Upcoming Activities

- Geotechnical drilling will begin in Lake Travis, in early April.
- Site Plan Work shop with facilitator scheduled April 17, 2007.
- Preliminary engineering work continuing
- Draft evaluations of chlorine storage and feed options are being reviewed
- Draft evaluation of options for handling Lime Residuals are being reviewed
- Continue to work with Site Development Plan Reviewers on proposed plans to begin construction of the Storm water facilities in October 2007.
- Preliminary concepts are being developed for the administration building, and potential LEED credits

Communications

Recent Activities

- A newsletter on the WTP 4 Project is being prepared for issuance in April.
- New information was posted to the WTP 4 website at <http://www.ci.austin.tx.us/water/wtpfour.htm>.
- A meeting was held with the Overlook@ Bull Creek Homeowners Association and the Upper Bull Creek Neighborhood Association to discuss the status of the project.
- The information email and the information telephone line are logging and calls and responses are being added to the Listening Log.

Upcoming Activities

- Monthly status reports will be prepared and distributed to the Environmental Board and others.
- 1st of two Community Wide Open House Meeting for this year has been scheduled for mid April. Invitations will be sent out to the public.

**INTERLOCAL AGREEMENT BETWEEN THE LOWER COLORADO RIVER
AUTHORITY AND THE CITY OF AUSTIN**

Executive Summary

This Agreement between the City of Austin (City) and the Lower Colorado River Authority (LCRA) results in the City issuing a development permit within the City of Austin city limits (if applicable) and the extra-territorial jurisdiction (ETJ) in the Lake Travis watershed as shown on Figure 1. The City's development permit will include water quality protection requirements that are equal to or greater than the protection provided by the LCRA Highland Lakes Watershed Ordinance. Thus, "one-stop" shopping is achieved in development permitting in the City limits (if applicable) and ETJ. The City will seek LCRA's input on projects requesting a water quality variance. Since LCRA has technical expertise relating to water quality protection in the Lake Travis area, the City and LCRA will cooperate in the land development management process to manage the lake resources to the maximum extent practical. In the end, the City has the water quality protection ordinance and resources to successfully administer water quality protection in the Lake Travis watershed, can work directly with the residents and developers of their community, yet can rely on LCRA as a technical resource throughout the process.

This Interlocal Agreement ("Agreement") is made and entered into pursuant to the Interlocal Cooperation Act, Texas Government Code Chapter 791, by and between the Lower Colorado River Authority, a conservation and reclamation district created pursuant to Article 16, Section 59 of the Constitution of the State of Texas, and the City of Austin, Texas, a political subdivision of the State of Texas, for the purpose of coordinating policies and programs which will preserve and protect water quality in the City, the extraterritorial jurisdiction of the City, and Lake Travis.

WITNESSETH:

WHEREAS, LCRA and the City are committed to preserving and protecting the water quality of the creeks and Lake Travis; and

WHEREAS, on the 16th day of November, 2005, the Board of Directors of LCRA adopted the Highland Lakes Watershed Ordinance ("Ordinance"), effective on February 1, 2006, which establishes certain requirements for managing stormwater runoff and pollution in the Highland Lakes region, including the Lake Travis watershed in Travis County; and

WHEREAS, the City of Austin Land Development Code applies within the City limits and extraterritorial jurisdiction within a portion of the Lake Travis watershed, and

Agenda Item C-4 ✓

WHEREAS, the City's Land Development Code provides management of stormwater pollution that is equal to or greater than that provided by the LCRA ordinance.

WHEREAS, the City requires a landowner or land user to manage stormwater runoff and obtain a development permit before commencing development;

WHEREAS, the LCRA and the City wish to cooperate closely in administering their permitting programs, and in devising policies to protect water quality that are efficient, effective, and enforceable.

NOW, THEREFORE, LCRA and the City agree as follows:

I. JURISDICTIONAL AGREEMENT

The LCRA and the City agree that, subject to the conditions agreed to below, LCRA's Highland Lakes Watershed Ordinance and its subsequent amendments shall not apply within the City limits and its extraterritorial jurisdiction (ETJ) in the Lake Travis watershed. The City shall administer the City of Austin Land Development Code in the Lake Travis watershed to provide protection of Lake Travis and its tributaries that is as protective or greater than that provided by the LCRA's Highland Lakes Watershed Ordinance.

This Agreement does not impact the Interlocal Agreements of or any amendments thereto between the City of Austin and Jonestown or the City of Austin and Lago Vista.

II. CITY RESPONSIBILITIES.

1. The City shall initiate an ordinance review process to update the Land Development Code within the Lake Travis watershed to include low impact development approaches and other techniques found in the LCRA Ordinance and Technical Manual. Land Development Code shall be, at a minimum, as protective of water quality as the LCRA's Highland Lakes Watershed Ordinance.
2. If the applicant seeks a variance from the water quality protection measures found in the Land Development Code, the City shall provide notice to LCRA.
3. The City shall provide notice to LCRA Water Resource Protection staff for review and comment on any changes to the City limits through annexation or extraterritorial jurisdiction transfers and proposed amendments to the City's water quality protection measures in the Lake Travis watershed.
4. Prior to commence of construction, the City will host a pre-construction meeting at the site that is attended by the City and the owner's representatives.
5. The City shall perform construction inspection relating to the requirements found in the

development permit, including water quality requirements. The City may contact LCRA for input on construction inspection activities.

6. The City will perform enforcement as necessary to ensure that the project remains in compliance with the Land Development Code.
7. At project completion, the City will host a final project inspection meeting at the site that is attended by the City and the owner's representatives.
8. Upon successful project completion, the project will come under the City's annual inspection program to ensure that maintenance is performed per the City standards.
9. The City will perform enforcement as necessary to ensure that the permitted and constructed water quality controls are maintained in accordance with the permit requirements.
10. The City agrees to make available and distribute water quality and conservation education materials. These materials may be billing inserts displays in the City office, website information, and information packets to residents. LCRA will provide materials and support to the City upon request.
11. The City agrees to meet semi-annually with LCRA to ensure program coordination.

III. LCRA RESPONSIBILITIES

1. At LCRA's discretion, LCRA may review permit applications that have requested a variance to City's ordinance. LCRA may provide input on the variance request.
2. LCRA will assist the City upon request in designing water quality management controls including best management practices for the City Capital Improvement Projects and for parkland that the City may lease from LCRA.
3. LCRA will provide 30 days advance written notice to the City of any proposed amendments to the LCRA Highland Lakes Watershed Ordinance.
4. LCRA will provide water quality and water conservation education materials to the City to share with residents of new projects. LCRA will participate in water quality education programs in the agreement area.
5. LCRA agrees to meet semi-annually with the City to ensure program coordination.

IV. MISCELLANEOUS

1. This term of this Agreement shall be for the remainder of the calendar year in which it was executed and shall be automatically renewed from year to year unless terminated by either party following 30 days advanced written notice.

2. This Agreement represents the entire agreement between the City and LCRA and supersedes all prior negotiations, representations, or agreements, either written or oral. This Agreement may be amended only by written instrument signed by both the City and LCRA. No official, employee, agent, or representative of the City or LCRA has any authority, either express or implied, to amend this Agreement, except by such express authority as may be granted by the governing bodies of the City and LCRA.
3. If the final judgment of a court of competent jurisdiction invalidates any part of this Agreement, then the remaining parts shall be enforced, to the extent possible, consistent with the intent of the parties as evidenced by this Agreement.
4. Regardless of the actual drafter, this Agreement shall, in the event of dispute over its meaning or application, be interpreted fairly and reasonably, and neither more strongly for or against either party.
5. Any notice to be given hereunder by either party to the other shall be in writing and may be effected to personal delivery or registered or certified mail, return receipt requested, addressed to the proper party, at the following address:

LCRA: Joe Beal, General Manager
LCRA
P.O. Box 220
Austin, Texas 78767

With copy to: Tom Hegemier, Water Resource Protection
LCRA
P.O. Box 220
Austin, Texas 78767

City of Austin: Will Wynn (or his successor in office)
Mayor, City of Austin
P.O. Box 1088
Austin, Texas 78767

With copy to: Toby Hammett Futrell
City Manager
P.O. Box 1088
Austin, Texas 78767

Each party may change the address for notice to it by giving notice of such change in accordance with the provisions in this paragraph.

6. The signatories hereby acknowledge that this Agreement is duly authorized by the governing bodies of LCRA and the City.

LOWER COLORADO RIVER AUTHORITY

By: _____ Date: _____
Joe Beal

CITY OF AUSTIN

By: _____ Date: _____
Toby Hammett Futrell
City Manager

APPROVED AS TO FORM:

By: _____
City of Austin
Law Department

Environmental Board

May 2, 2007

6:00 P.M.

Applicant [REDACTED]
Address [REDACTED]
City Staff Michael Embesi

Issue

The applicant has requested to remove two protected size trees to qualify for an Austin Energy rebate program. This request was denied by the City Arborist based upon the Land Development Code's tree preservation criteria. The applicant has appealed the City Arborist's decision not to allow the trees to be removed.

Attachments

Tree Ordinance Review Application (with photographs)
Tree and Natural Area Protection Ordinance
Austin Energy Solar Rebate Program
Hyde Park Neighborhood Plan

Tree Ordinance Review Application

City of Austin

Founded by Congress, Republic of Texas, 1839
 Watershed Protection and Development Review Department
 One Texas Center, 505 Barton Springs Road
 P.O. Box 1088, Austin, Texas 78767
 Phone: (512) 974-1876 Fax: (512) 974-3010



Paid: Yes/No _____
 Receipt Number: _____
 Inspection Date: _____

November 2005

This application requests¹ (specify all that apply):

- removal of a protected-size tree; 2 trees
- development exceeding allowable standards for encroachment in the critical root zone²;
- removal of more than 30% of a tree's crown².

¹ Additional tree information may be obtained from the Land Development Code (25-8), Environmental Criteria Manual (Section 3), or the City of Austin Urban Forestry web page (<http://www.ci.austin.tx.us/trees/>).

² Applicant understands that encroachment in the critical root zone, or removal of canopy, may threaten the health of the tree and that approval of this application does not guarantee the continued health of the tree.

Please attach an aerial drawing that includes the location of the tree, proposed development, and utilities. The application and payment (check to the City of Austin for \$25 per tree) can be mailed or delivered to the above addresses. Payment must be made prior to City personnel completing this application. If relevant, check and initial the following box to indicate that the fee is to be applied to the building permit (i.e. escrow payment). _____

Address of Property (including zip code): [redacted] Austin, TX 78751

Name(s) of Owner and Applicant: [redacted]

Building Permit Number (if applicable): _____

Telephone Number: [redacted] Fax Number: [redacted]

Type of Tree: pecan (both) Location on Lot: in front by street

Trunk Circumference (inches around) at 4 1/2 Feet Above Ground: 80 1/2" + 75 3/4"

General Condition: Fair

Reason for Request: to qualify for solar rebate program

[redacted] 2-12-07
 Owner/Applicant Signature Date

TO BE COMPLETED BY CITY ARBORIST

Approved | *Approved With Conditions | Denied | Statutory Denial (more information required)

Comments: (1) PROVIDE DOCUMENTATION SUPPORTING TREE REMOVAL REQUEST AS IT PERTAINS TO SOLAR REBATE PROGRAM (2) IF IMPACTING THESE TREES IS STILL DESIRED, SUBMIT PRUNING PLAN FROM A CERTIFIED ARBORIST

*Conditions of Approval: None; As described within Arborist Comments (see above); and/or, for

Applicant agrees to plant _____ caliper inches, container grown, City of Austin Class 1 trees (i.e. Live Oak, Cedar Elm, Mountain Laurel) on the lot prior to obtaining a Certificate of Occupancy (trees are to be a minimum of two inches in caliper width). Prior to development, applicant agrees to supply a root zone mulch layer and maintain tree protection fencing (chain-link, five-foot in height) providing the utmost root zone protection.

[redacted] [Signature] 21 FEB 07
 Owner/Applicant Signature Date City Arborist Signature Date

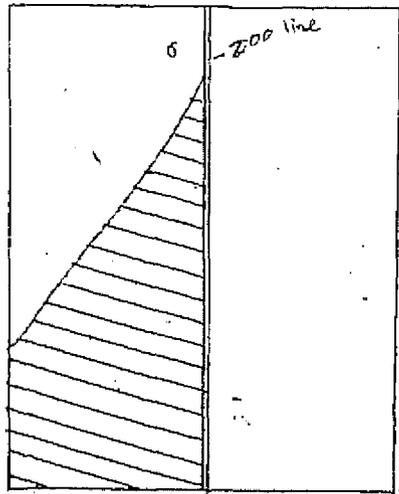
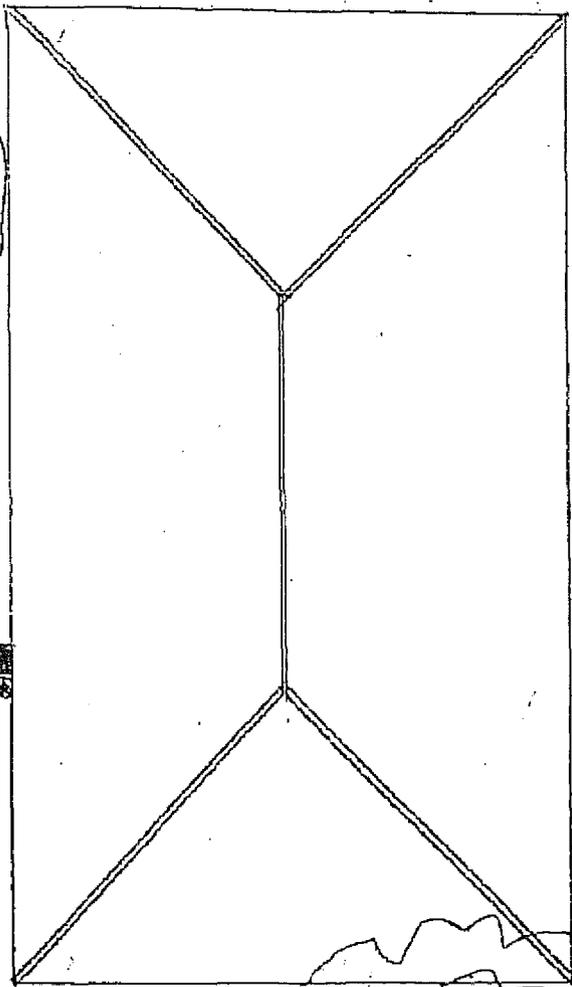
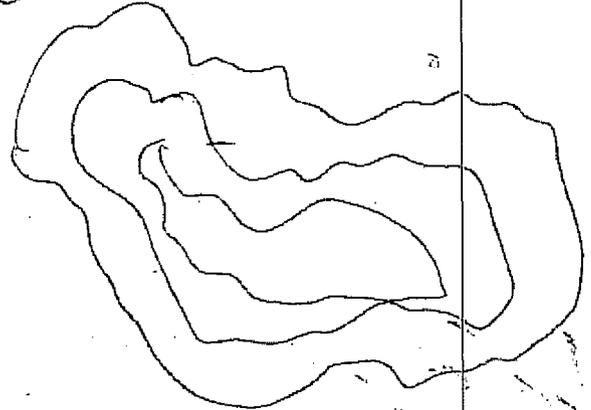
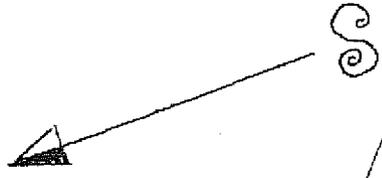
ARBORIST
 BE
 CON-SIGNED

R1377

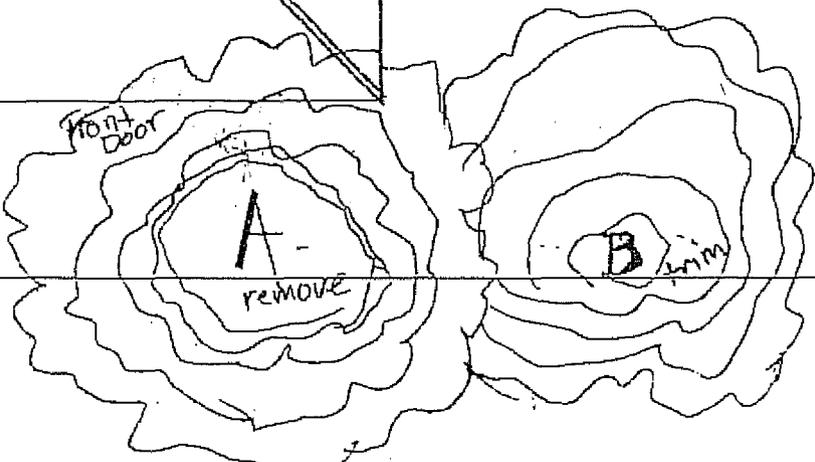
~~2.5kW~~ 2.5kW conditional

Site Diagram Showing:
 Bldg Plan
 Orientation
 Roof Slopes
 Sprial Obstructions
 Likely Location for PV
 Elec. Service Entrance

 = 210 @ 25° tilt



electrical service



June 2006

2



Ref. # R1377

Solar PV Rebate Program Preliminary Site Assessment Form

Customer Name	<u>[Redacted]</u> to <u>[Redacted]</u>
Address	<u>[Redacted]</u>
Account #	<u>[Redacted]</u>
City, State, Zip	<u>Austin TX 78751</u>
Phone #	<u>[Redacted]</u>
AE Inspector	<u>T.C. Haney</u>
Date	<u>1-26-07</u>

Deed Restriction? Yes No Doesn't Know
Is Applicant Home/Building Owner? Yes No

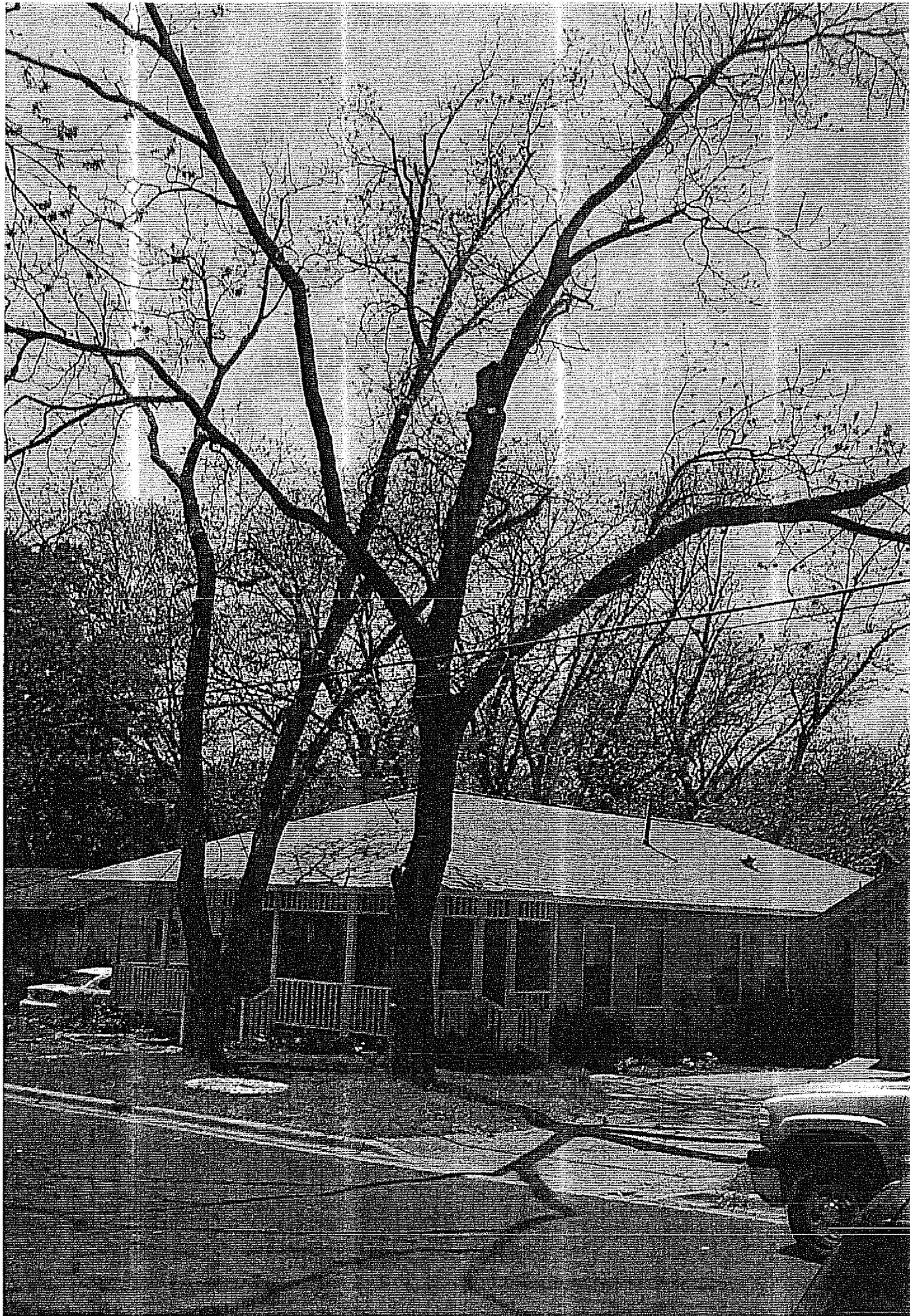
Building:
 Type: Residential SF Residential MF Commercial
 Sq. Ft. 1800

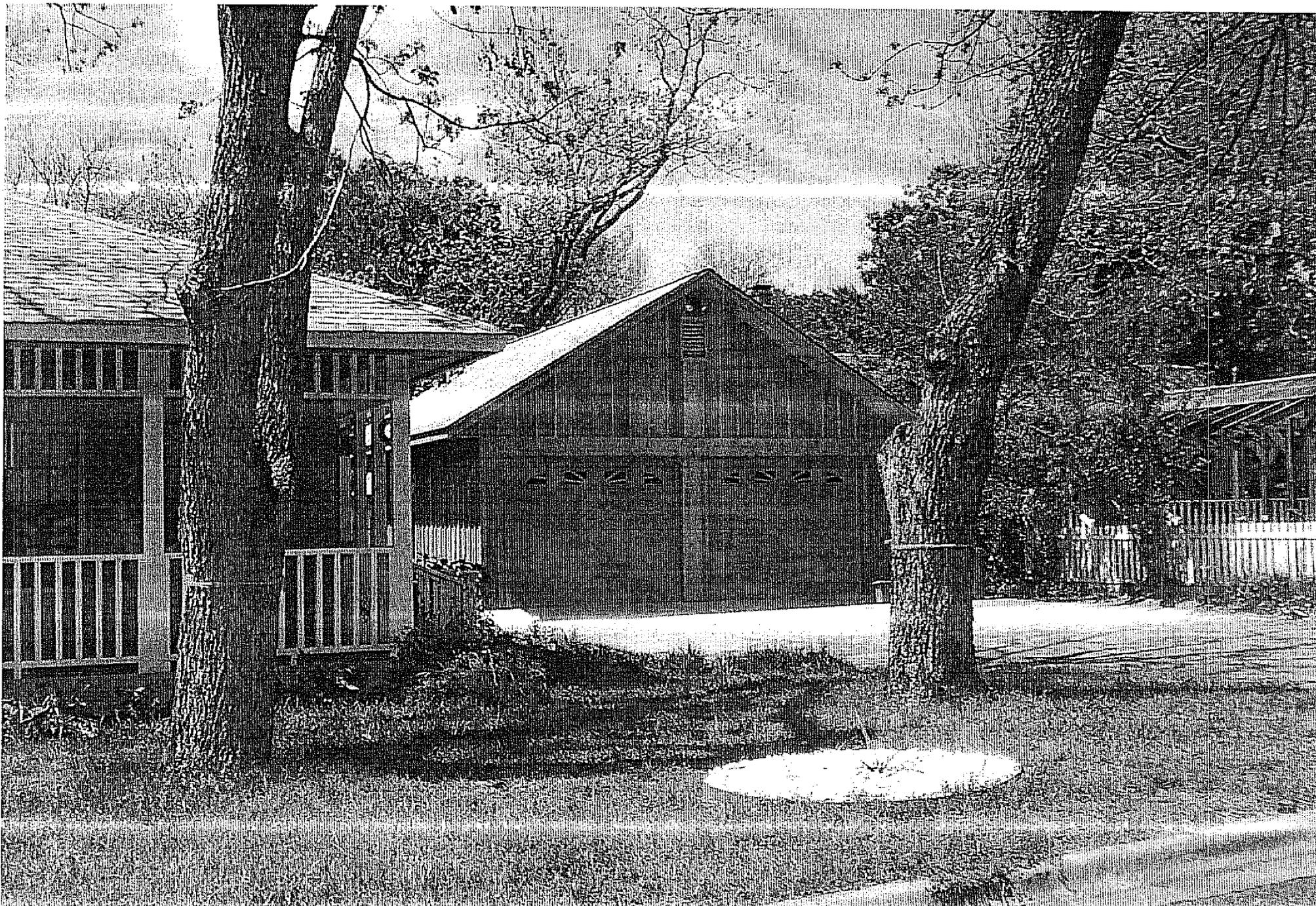
Roof Section for PV Array:
 Orientation: 210° Approx. Pitch: 25° Approx. Area: 300 f²
 Shading: Heavy Roof Type: Shingle Roof Condition: new
 Height: 15' 0" Wall Const: Wood

Initial Inspection Result:
 Yes, site qualifies for rebate
 If yes, potential system size (kW) 2.5 kW
 Conditional, site may qualify for rebate if conditions are met (see below)
 No, site does not qualify for rebate

Conditions (if applicable): Panel upgrade - Remove tree "A" from tree "B" to 8:00am

Additional Recommendations:





5

Tree and Natural Area Protection Ordinance

ARTICLE 1. TREE AND NATURAL AREA PROTECTION.

Division 1. General Provisions.

§ 25-8-601 APPLICABILITY.

(A) Except as provided in Subsection (B), this article applies in the zoning jurisdiction.

(B) For a preliminary plan, final plat, or subdivision construction plan in the portion of the city's extraterritorial jurisdiction that is within Travis County:

(1) this article does not apply; and

(2) Title 30 (*Austin/Travis County Subdivision Regulations*) governs.

Source: Section 13-7-37(d); Ord. 990225-70; Ord. 031211-11; Ord. 031211-42.

§ 25-8-602 DEFINITIONS.

In this article:

(1) OWNER includes a lessee.

(2) PROTECTED TREE means a tree with a circumference of 60 inches or more, measured four and one-half feet above natural grade.

(3) REMOVAL means an act that causes or may be reasonably expected to cause a tree to die, including:

(a) uprooting;

(b) severing the main trunk;

(c) damaging the root system; and

(d) excessive pruning.

Source: Section 13-7-38; Ord. 990225-70; Ord. 031211-11.

§ 25-8-605 WAIVER AND MODIFICATION OF CITY REQUIREMENTS.

(A) If enforcement of a City department policy, rule, or design standard will result in removal of a protected tree, the Watershed Protection and Development Review Department may request that the responsible City department waive or modify the policy, rule, or design standard to the extent necessary to save the tree.

(B) The responsible City department may waive or modify the policy, rule, or design standard after determining that a waiver or modification will not result in a serious or imminent adverse effect.

(C) The city manager shall resolve differences of opinion between the Watershed Protection and Development Review Department and another City department under this section.

Source: Section 13-7-43; Ord. 990225-70; Ord. 010329-18; Ord. 031211-11.

Division 2. Protected Trees.

§ 25-8-621 PERMIT REQUIRED FOR REMOVAL OF PROTECTED TREES;

EXCEPTIONS.

(A) Except as otherwise provided in this section, a person may not remove a protected tree unless the Watershed Protection and Development Review Department has issued a permit for the removal under this division.

(B) A person may, without a permit, remove a damaged protected tree that is a hazard to life or property if the tree is removed within seven days of being damaged. The Watershed Protection and Development Review Department may extend this deadline for widespread and extensive storm damage.

(C) A person may, without a permit, remove a protected tree if the tree is identified for removal on an approved preliminary plan or site plan.

(D) A person may, without a permit, remove a protected tree if the tree is identified for removal in a capital improvement project when the project is approved by council.

Source: Section 13-7-46; Ord. 990225-70; Ord. 010329-18; Ord. 031211-11.

§ 25-8-622 APPLICATION FOR REMOVAL.

(A) For a protected tree located on public property or a public street or easement, an application for removal of the tree may be filed by:

(1) a City department, public utility, or political subdivision with the authority to install utility lines or other public facilities in or above the property, street, or easement; or

(2) the owner of property adjoining the site of the tree.

(B) For a protected tree located on private property, an application for removal of the tree may be filed by:

- (1) the owner of the property on which the tree is located; or
- (2) the city arborist, if the tree is seriously diseased or is a safety hazard.

(C) An application for removal of a protected tree must:

- (1) be filed with the director; and
- (2) include the information prescribed by the Administrative Manual.

(D) An application fee is not required if the application is for removal under Subsection 25-8-624(A)(3), (4), or (5) (*Approval Criteria*).

Source: Section 13-7-47; Ord. 990225-70; Ord. 010329-18; Ord. 031211-11.

§ 25-8-623 INSPECTION BY CITY ARBORIST.

The city arborist shall promptly inspect a tree for which removal is requested.

Source: Section 13-7-41(a); Ord. 990225-70; Ord. 031211-11.

§ 25-8-624 APPROVAL CRITERIA.

(A) The Watershed Protection and Development Review Department shall approve an application to remove a protected tree after determining that the tree:

- (1) prevents reasonable access to the property;
- (2) prevents a reasonable use of the property;
- (3) is a hazard to life or property, and the hazard cannot reasonably be mitigated without removing the tree;
- (4) is dying or dead;
- (5) is diseased, and:
 - (a) restoration to sound condition is not practicable; or
 - (b) the disease may be transmitted to other trees and endanger their health; or
- (6) for a tree located on public property or a public street or easement:

- (a) prevents the opening of necessary vehicular traffic lanes in a street or alley; or
- (b) prevents the construction of utility or drainage facilities that may not feasibly be rerouted.

(B) If an application filed by a political subdivision of the state is approved under Subsection (A)(2), the Land Use Commission may, in its discretion, review the approval.

(C) For an application to remove a protected tree located on private property, an applicant must request a variance from the Board of Adjustment if the variance would eliminate the reason for removal of the tree.

(1) The application to remove the protected tree may not be approved unless the variance is denied.

(2) An application fee is not required for a variance request required by this subsection.

(3) This subsection does not apply to an application that may be approved under Subsection (A)(3), (4), or (5).

(D) The Watershed Protection and Development Review Department may require mitigation, including the planting of replacement trees, as a condition of application approval. A removal permit may not be issued until the applicant satisfies the condition or posts fiscal security to ensure performance of the condition within one year.

Source: Section 13-7-41(b), (c), (d), and (f); Ord. 990225-70; Ord. 010329-18; Ord. 010607-8; Ord. 031211-11.

§ 25-8-625 ACTION ON APPLICATION.

(A) The Watershed Protection and Development Review Department shall approve or deny an application to remove a protected tree:

(1) not later than the 10th day after the application is filed; or

(2) if a variance request is required by Subsection 25-8-624(C) (*Approval Criteria*), not later than the 55th day after the application is filed.

(B) If a variance request is required by Subsection 25-8-624(C) (*Approval Criteria*), the Watershed Protection and Development Review Department shall notify the applicant of the 55-day review period.

(C) An application is automatically granted if the Watershed Protection and Development Review Department does not deny the application before the expiration of the applicable deadline in Subsection (A).

Source: Section 13-7-41(a); Ord. 990225-70; Ord. 010329-18; Ord. 031211-11.

§ 25-8-626 EFFECTIVE DATE AND EXPIRATION OF APPROVAL.

(A) Approval of an application to remove a protected tree is effective:

(1) on the third day after it is granted; or

(2) immediately, if the application was approved under Subsection 25-8-624(A)(3), (4), or (5) (*Approval Criteria*).

(B) An approval to remove a protected tree expires:

(1) one year after its effective date; or

(2) for a development described in Subsection 25-8-621(C) or (D) (*Permit Required For Removal Of Protected Trees; Exceptions*), when the development plan expires.

Source: Section 13-7-41(e); Ord. 990225-70; Ord. 031211-11.

§ 25-8-627 APPEAL.

An applicant may appeal the denial of an application to remove a protected tree to the Land Use Commission.

Source: Section 13-7-42; Ord. 990225-70; Ord. 010607-8; Ord. 031211-11.

Austin Energy Solar Rebate Program

Austin Energy offers solar rebates to our electric customers to help implement solar technology in homes or businesses. The rebates help offset the cost of a solar photovoltaic electric system. As a municipally-owned utility, Austin Energy may only offer this program to our customers.

Austin Energy offers customers one of the highest solar rebates in the country at \$4.50 per watt. This rebate level will pay between 45-75% of the cost of installation of a solar system.

For a residence, the cost of installation of a 1-kilowatt (1,000 watts) solar system, the smallest considered practical, is expected to cost between \$6,000 and \$10,000. The Austin Energy rebate (\$4.50 x 1,000 watts) will pay \$4,500 toward the installation.

Rebate Program Details

Investing in solar technology is an investment in Austin's future. There are many **benefits to you as a customer** as well as **benefits for the Austin community**.

Decide if a Solar System Is Right for You

To begin your decision making process follow these step:

1. **Review the Solar Candidate Checklist.**
The information in the checklist is a good starting point for customers interested in pursuing solar technology.
2. **Review the Solar Rebate Program Guidelines.**
This will provide you with detailed information on program requirements.
3. **Complete the Solar Rebate Participation Form.**
An Austin Energy representative will contact you and schedule a preliminary survey of your property. The results of the survey will determine rebate eligibility.

Select a Solar Installer

Austin Energy will only provide rebates to customers who use a **Participating Solar Installer** from the Austin Energy Participating Company List.

1. **Select a Participating Solar Installer** from our Solar Rebate Program Participating Company List.
2. **Schedule a review of your property and request a bid.**
The installer will assist in you in determining the specific needs for your property. As with any project, you may want to talk to multiple installers and receive several bids.

Have Your Rebate Approved Prior to Installation

To qualify for the solar rebate program, Austin Energy must approve your solar system project prior to installation.

1. **Submit your rebate application (pdf).**

Your Austin Energy Registered Solar Installer will assist in the rebate application process to secure these rebates for you.

2. **Wait for rebate approval.**

Austin Energy will send you a Letter of Intent (LOI) after your rebate application is received and approved. This letter guarantees your rebate request for 120 days.

Complete Your Solar System Installation

Once your rebate application is approved, proceed with your solar system installation.

1. **Have your solar system installed by a Participating Solar Installer.**

A professional installation will typically take two or three days for a home. For commercial installations, consult your solar installer.

2. **Contact Austin Energy (482-5346) to conduct the final inspection.**

After the inspection, the inspector will collect and verify all the project documentation required for processing your rebate. The rebate is issued within four (4) weeks.

Solar Candidate Checklist

Many factors may impact your decisions to install a solar system. Here are a few things to consider:



Are you an Austin Energy customer?

The Solar Rebate Program is available exclusively to Austin Energy customers.



Do you own the property?

The Solar Rebate Program is for property owners.



Does the roof face east, west or south?

North-facing roofs do not allow full utilization of sunlight. **(Austin Energy retains the right to deny rebates based on poor orientation of the solar system.)**



Is the roof unobstructed and non-shaded?

The property must have minimal shading by trees, buildings and other structures. **(Austin Energy retains the right to deny rebates based on excessive shading of the solar system.)**



Is the property free from deed restrictions on solar systems?

Check with your homeowners' association. If there are restrictions you may be able to pursue an architectural review with your neighborhood association to amend the restrictions.



Is the roof in good condition?

Your roof must be able to support a solar system installation. New roofing should be completed prior to the installation.



Do you have access to funds needed?

Residential customers may pay in the range of \$1,500 - \$10,500 out of pocket.
Commercial customers may pay \$1,000 - \$60,000 out of pocket. **(These figures are estimates; actual out of pocket expenses may exceed stated estimates.)**

Is the payback period acceptable?

Typical payback for a solar system can range from 7 – 25 years, based on the total cost (equipment and installation) of the system.

Solar Rebate Program Guidelines

Installation and Warranties

- Rebate applicants must use a **Participating Solar Installer** from the Austin Energy Participating Company List.
- All work must be performed in accordance with all applicable federal, state, and local, manufacturer's codes and standards and **Austin Energy (AE) Interconnection Guidelines (pdf)**.
- Only eligible solar system modules qualify for rebates under the AE program. As a **list of eligible solar system modules** and a **list of eligible solar system inverters**, AE adopts by reference those listed by the California Energy Commission on its Web site.
NOTE: Austin Energy is not a manufacturer, supplier or guarantor of the PV system or installers, and AE, whether by making available a list of registered installers and equipment sources or otherwise, has not made and makes no representations or warranties of any nature, directly or indirectly, express or implied, as to performance of the installer or reliability, performance, durability, condition or quality of the PV system selected and purchased.
- All solar systems installed must carry a 5-year warranty from the manufacturer and installer.
- Licensed electrical contractors must obtain appropriate permits and perform all electrical interconnections.
- All solar systems must be interconnected, at customer's expense, to AE's electrical grid. The solar system will comply with current City of Austin (COA) guidelines governing interconnection with COA's electric system, and any subsequent revisions to these guidelines. The customer will return to AE a completed interconnection application form and signed agreements.
- If re-roofing is required, solar system removal and reinstallation is at customer expense.
- Batteries will not be covered under the rebate.

Rebate Funding

- Applicant must be an Austin Energy customer.
- Rebate funding is offered on a first-come, first-served basis.
- Participation in the Solar Rebate Program does not affect customer participation in other AE energy efficiency programs.
- AE will perform a pre-inspection of the site; results of the pre-inspection will determine rebate eligibility. Solar Pathfinder plot must demonstrate minimal shading by trees,

buildings and other structures. AE retains the right to deny rebates based on excessive shading and or poor orientation of the solar array.

- ∴ The requested rebate amount will be calculated as:
[Number of PV Modules] x [STC Rating per Module (Watts)] x [Inverter Efficiency] x
[\$4.50/W or \$6.25/W depending upon whether the PV is made locally within the Austin electric service area].
- ∴ The standard rebate level for qualifying equipment is \$4.50 per watt (including nonprofit organizations). In an effort to promote solar technologies and economic growth, qualifying equipment manufactured or assembled in Austin Energy's electric service area may qualify for rebates at a level not to exceed \$6.25 per watt. "Manufactured or assembled" does not include installation of the system. Eligibility requirements for the \$6.25 per watt rebate are in development.
- ∴ The final rebate level will be determined following verification of the installed system by AE solar field inspector.
- ∴ Rebates for residential customers are capped at 80% of customer invoiced cost or \$13,500, whichever is less.
- ∴ Rebates for commercial customers are capped at 80% of customer invoiced cost or \$100,000, whichever is less.
- ∴ The current rebate maximum is valid at each location per fiscal year.
- ∴ Depending on the total commercial rebate amount, City Council approval may be required.
- ∴ Customer will be provided a Letter of Intent (LOI) after rebate application is received and approved (valid for 120 days), assuming the solar system meets program guidelines.
- ∴ Customers have the option to assign the rebate directly to the PV system installer.

Additional Requirements

- ∴ Deed restrictions must not prohibit the installation of solar system on property.
- ∴ The customer must transfer to AE, all renewable energy credits (RECs) and other environmental attributes from power generated by PV systems receiving rebates from Austin Energy. Review [**AE Renewable Energy Credit Agreement \(pdf\)>>**](#)
- ∴ Solar system cannot be removed from AE service territory.
- ∴ Customer must sign the rebate refund agreement on the [**Solar Rebate Application form \(pdf\)**](#).
- ∴ AE guidelines and rebate levels are subject to change without notice, and AE reserves the right to refuse any application/request for incentive payment that does not meet AE's requirements.

Solar Rebate Program Guidelines - Forms and Documents

- ∴ [**Solar Rebate Program Guidelines \(pdf\)**](#)
- ∴ [**AE Renewable Energy Credit Agreement \(pdf\)**](#)
- ∴ [**Austin Energy Interconnection Guidelines \(pdf\)**](#)
- ∴ [**Solar Rebate Application Form \(pdf\)**](#)

HYDE PARK NEIGHBORHOOD PLAN

April 13, 2000



City of Austin
Planning, Environmental & Conservation Services Department
1011 San Jacinto, 3rd Floor
P.O. Box 1088
Austin, Texas 78767

HYDE PARK NEIGHBORHOOD PLAN

ORDINANCE NO. 000413-63

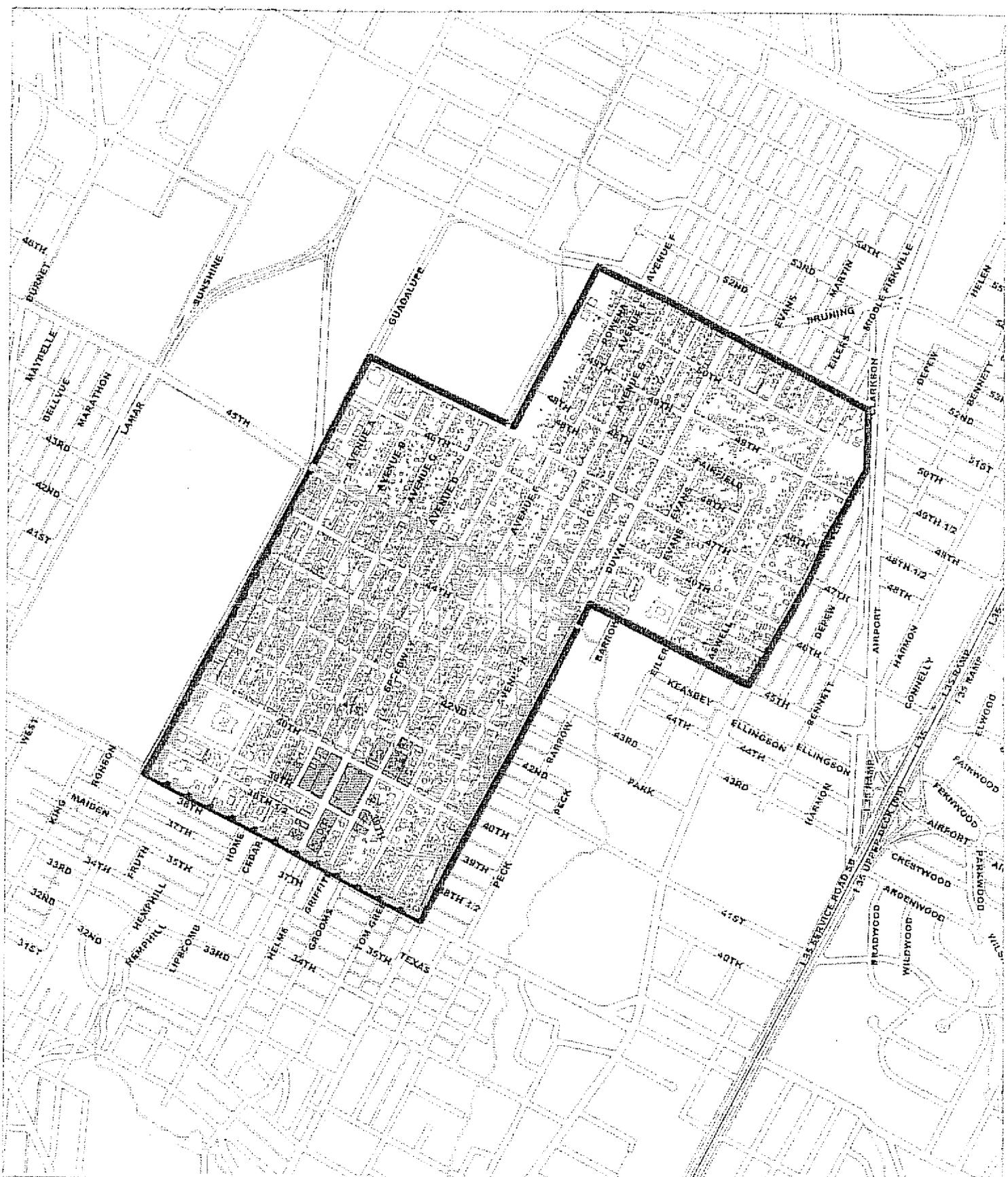
April 13, 2000

By adopting the plan, the City Council demonstrates the City's commitment to the implementation of the plan. However, every action item listed in this plan will require separate and specific implementation. Adoption of the plan does not begin the implementation of any item. Approval of the plan does not legally obligate the City to implement any particular action item. The implementation will require specific actions by the neighborhood, the City and by other agencies. The Neighborhood Plan will be supported and implemented by:

- City Boards, Commissions and Staff
- City Departmental Budgets
- Capital Improvement Projects
- Other Agencies and Organizations
- Direct Neighborhood Action

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**Hyde Park Neighborhood Planning Area
Base Map**



PECS
Neighborhood Planning
Plotted: April 1999



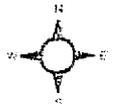
Hyde Park Historic
District Boundary

Hyde Park Civic
NCCD (Barst Church)

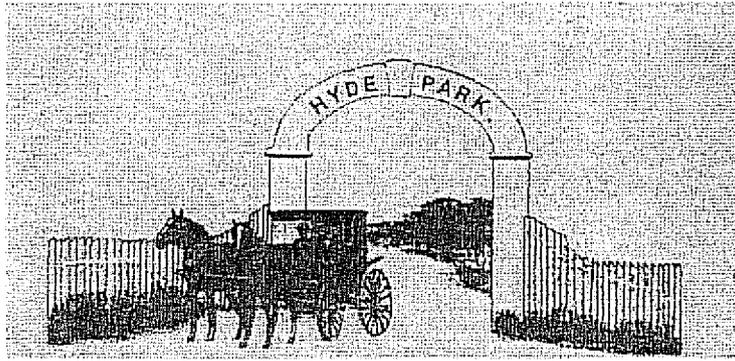


Proposed Neighborhood
Conservation Combining District

Hyde Park Neighborhood
Planning Boundary



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*Photo from Austin's Hyde Park,
(Austin History Center)
Sarah and Thad Sitton*

HYDE PARK NEIGHBORHOOD PLAN

Adopted April 13, 2000

Summary

Hyde Park was established in 1891. It is a recognized historic area and is notable for its diversity of people, structures and land uses. The Hyde Park community has been active in preserving the unique character of its neighborhood since the 1970s. The first neighborhood plan was adopted in 1985 by the neighborhood association. The current plan is inspired by the 1985 plan and documents created between 1991-1994 in preparation for a Neighborhood Combining Conservation District (NCCD). This plan also incorporates the comments and suggestions offered by participants in a number of workshops held in the community this year. The following summary introduces the Hyde Park neighborhood and documents the process that produced this current neighborhood plan.

The Hyde Park Neighborhood

Hyde Park is primarily a residential neighborhood located in close proximity to the University of Texas, the Texas Capitol, and downtown Austin. The thoroughfares of 38th Street, 51st Street, Guadalupe Street, Duval Street and Red River Street form distinctive neighborhood boundaries. These streets, along with Speedway Avenue, have been the sites of multi-family and commercial development due to the application of more intense zoning districts. Visitors and residents of Hyde Park admire its natural beauty. It has been described as an urban forest with many pecan trees and other varieties lining its streets. Hyde Park today is home to people of many different ages and backgrounds and its attraction as a neighborhood is illustrated in recent years by the increasing numbers of people, including University students, who choose to live in Hyde Park.

Definition

Neighborhood Conservation Combining District (NCCD) – is a zoning overlay “intended to preserve and protect older neighborhoods by allowing modifications to applicable regulations in accordance with a neighborhood plan for development and conservation”. §13-2-130 Land Development Code

Introduction

This plan begins with an introduction to the history and character of Hyde Park, which is critical for an informed understanding of this neighborhood. Each of the goals, and the objectives and actions necessary to achieve them, is outlined and elaborated upon in this plan. The adoption of this plan will ensure that this unique neighborhood will continue to be enjoyed by its residents and visitors for many generations to come.

History of Hyde Park

On January 3, 1891, Monroe Shipe filed the plat for the first Hyde Park Addition to the City of Austin. He intentionally designed it to be Austin's first streetcar-suburb, far from the core of the city. This plan produced an integrated system of streetscapes, transportation, civic features, alleys, utilities and services.



*Photo of Monroe Shipe
from Austin's Hyde Park,
(Austin History Center)
Sarah and Thad Sitton*

Shipe's original plan provided wide streets incorporating continuous sidewalks and a regular pattern of street trees providing shade for both the pedestrians and the roadway. Sidewalks were placed near property lines in what was to become the City's standard. The truth of his late 19th-century advertisements of "fine streets and perfect shade" has endured over a century with limited disruption from the original concept. Today, the pattern of the streets in Hyde Park – the trees, sidewalks, shade, green lawns, front porches, scale and character of the architecture—is the defining element of the neighborhood.

The development of the Hyde Park Additions was based upon an electric streetcar system that ran



Typical alley in Hyde Park

through the neighborhood. Alleys were constructed so as to make a clear distinction between

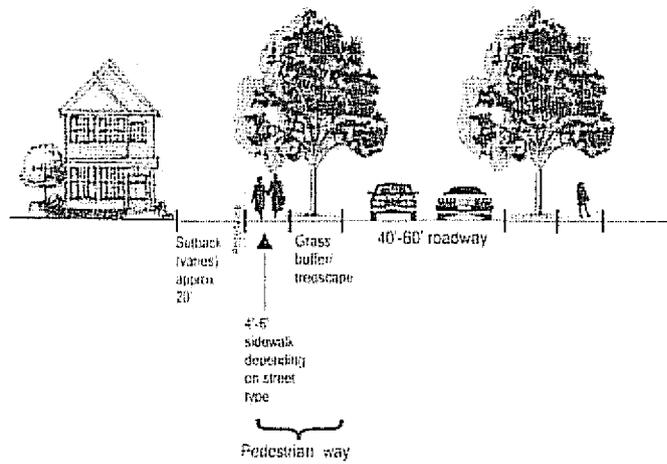
the lots on each side of the block and to conduct utility lines such as the electrical service, which was one of the selling points for the original development.



Typical alley in Hyde Park

Hyde Park Additions I and II were added to the City in 1891 and 1892 respectively. Monroe Shipe designed the 206-acre development in a grid pattern with 400-foot blocks. Lots were a

Conceptual Drawing of Traditional Streetscapes in Hyde Park



Sidewalk location	Status	Estimated linear feet
<u>Both sides of road:</u>		
Speedway	large gaps, obstructions	840
Duval	in progress	1100
Guadalupe	westside: sidewalk installed, some pedestrian improvements with Triangle development planned, eastside: repairs and improvements	0 could be improved in spots
38 th	repairs and gaps	southside: 610
45 th Priority #1 (links to Shipe Park, Bus stops)	large gaps, repairs (in process)	northside: 2250
46 th Priority # 5	none are present at this time	Unknown at this time
W. 40 th Priority #3	key gaps need to be filled in	1490
<u>At least one side</u>		
Ave. A	north of 40th, east OR west	2000
Ave B	north and south of 39th, westside	700
Ave C	north of 39th, eastside	855
Ave D	north of 39th, eastside	650
Ave F	north of 38th, westside	540
Avenue G Priority #2 (links to Shipe Park)	substantially incomplete North of 45th	800
	Near Shipe Park	420
Ave. H	north of 38th, eastside	310
43 rd St.	Complete on one side	Unknown at this time
Caswell Priority #4 (links to Ridgetop Elem.)	large gaps	Unknown at this time
Red River	large gaps	Unknown at this time

Total estimated linear feet (known at this time): 12,565 linear feet

Shaded = Highest priority sidewalks

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67. Retention ponds should *not* be required for single-family resubdivisions that result in traditional lot sizes and development that is in keeping with adjacent development. This is to address a few larger lots in the neighborhood that currently are not legal lots or need to be resubdivided into less than 4 traditional lots (under 1 acre). City Action Item: DRID, Watershed Protection

Most of the streets are bounded by curb and gutter; however there are some areas of streets in the study area have no curb and gutter coverage. Curb and gutter aids in the drainage of the streets and helps to maintain the continuity of the right of way (R.O.W) and prevent erosion.

68. Every street should be fitted continuously with curb and gutter to aid in drainage and maintenance of the right of way. Neighborhood Action Item: private property owners (as needed)

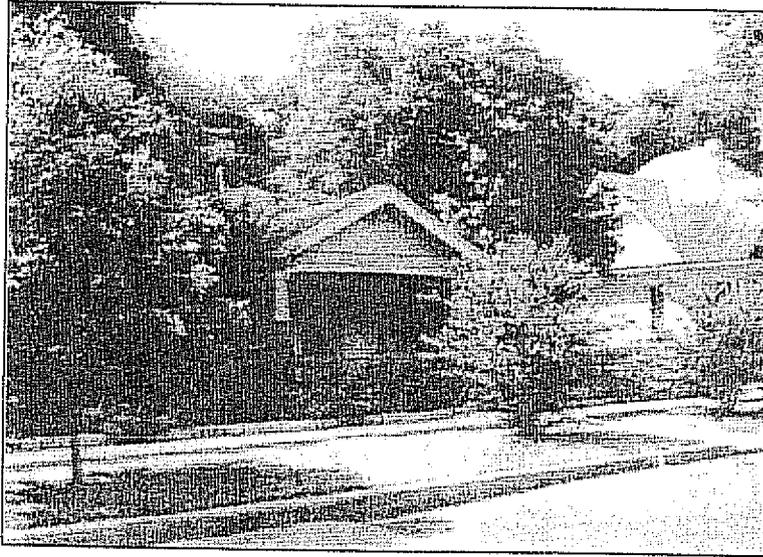
Before Hyde Park was developed, it was a post oak forest. Many of the trees were cut down and used for railroad ties. Today the neighborhood is an urban forest with many pecan trees and other varieties. The southwest corner of the neighborhood still contains a number of large post oak trees. Currently, the existing pattern of landscaping in the street right of way in the Hyde Park study area consists of trees that line the streets and provide shade to both pedestrian and motorist, and corner gardens that help beautify the neighborhood. Although this is a predominant pattern of landscape in the right of way, there are areas where the pattern is interrupted by excessive curb cuts and paving.

69. Identify, preserve, protect, replace and increase the trees and landscaping amenities in streetscapes, parks and other natural areas of Hyde Park. Neighborhood Action Item: HPNA, PARD, PWT

- ◆ Preserve the characteristic shade canopy by maintaining and extending the existing pattern of street trees. Prevent subterranean construction that would result in damage to existing street trees or prevent planting of street trees. Planning Principle: DRID, PWT
- ◆ Special efforts should be made to preserve significant trees and, if they are lost, to replace them with other large trees. Planning Principle: PARD
- ◆ Corner gardens should be allowed if they neither interrupt access by pedestrians on the right of way nor block the view of motorists per current City code. Planning Principle: HPNA

By and large, residents of Hyde Park tend to be committed not only to preserving their own neighborhood, but also to preserving the natural beauty and resources of the region as a whole. Aspects of neighborhood preservation, such as maintaining and enhancing the streetscape (thereby contributing to cleaner air) and improving the water quality in Waller Creek, promote this goal. However, attention to conservation of natural resources can be achieved in additional ways.

- ◆ Conserve the lawns, gardens, and open spaces associated with homes and other buildings. Planning Principle: HPNA, NPT, DRID





ITEM FOR ENVIRONMENTAL BOARD AGENDA

**BOARD MEETING
DATE REQUESTED:** May 16, 2007

**NAME AND NUMBER
OF PROJECT:** Pier Partners PUD
C814-06-0202

**NAME OF APPLICANT
OR ORGANIZATION:** Clark, Thomas & Winters
John Joseph, Attorney (472-8800)

LOCATION: 1703 River Hills Rd.

PROJECT FILING DATE: October 18, 2006

**WPDR/ENVIRONMENTAL
STAFF:** Betty Lambright, 974-2696
betty.lambright@ci.austin.tx.us

**WPDR/NPZ
CASE MANAGER** Jorge Rousselin, 974-2975
jorge.rousselin@ci.austin.tx.us

WATERSHED: Lake Austin (Water Supply Rural)

ORDINANCE: Planned Unit Development (PUD)

REQUESTS: Request to create a Planned Unit Development with
multiple environmental exceptions

**STAFF
RECOMMENDATION:** Not recommended.

AGENDA ITEM B-1



MEMORANDUM

TO: Betty Baker, Chairperson
Members of the Zoning and Platting Commission

FROM: Betty Lambright, Environmental Review Specialist Senior
Watershed Protection and Development Review Department

DATE: May 16, 2007

SUBJECT: Pier Partners PUD/C814-06-0202
1703 River Hills Rd.

The applicant is proposing a zoning change of CS-1 and LA to Planned Unit Development for the existing Pier restaurant (closed since October 2005) and adjacent structures on 10.3 acres of land. The existing facility consists of a 2559 sq. ft. of restaurant, 5400 sq. ft. of outdoor uncovered dining, approximately 1000 sq. ft. of covered dining/deck adjacent to Lake Austin, 18 boat stalls and refueling facility, unpaved parking, and a stage with lighting and sound. Access to the property is via an existing private driveway off River Hills Road.

The applicant's PUD proposal would allow for commercial, retail, dry-stacked marina, and restaurant uses along with 10 requested environmental exceptions. A 10,000 square foot restaurant is proposed along with a 25,000 square foot dry-stacked marina (including fueling) with a capacity for approximately 200 boats. Boat access to Lake Austin is proposed via a fork-lift system by which boats will be lowered onto the lake by way of designated access. Further zoning details are provided in the Zoning Review Sheet.

Description of Property

The proposed PUD is situated in the Lake Austin watershed, which is classified as a Water Supply Rural watershed. The tract lies in the Drinking Water Protection Zone, but it is not located over the Edwards Aquifer Recharge Zone. Floodplain, Critical Water Quality Zone (CWQZ), and steep slopes occur within the property lines.

Existing Topography/Soil Characteristics/Vegetation

At this time, the applicant has not provided an Environmental Assessment, a slope map, or Q1/Q2 tables at this point.

Critical Environmental Features/Endangered Species

The applicant has not provided an Environmental Assessment at this time.

Water/Wastewater

The applicant proposes to utilize on-site septic for wastewater. Water will be supplied by a water utility district.

Environmental Exception Requests

The exceptions requested by this project are to LDC Sections:

1. Exception from LDC 25-8-341 (Cut Requirements)

"Cut on a tract of land may not exceed 4' of depth."

The applicant is requesting a modification to allow cuts up to 20'.

2. Exception from LDC 25-8-342 (Fill Requirements)

"Fill on a tract of land may not exceed 4' of depth".

The applicant is requesting a modification to allow fill up to 6'.

3. Exception from LDC 25-8-454(D)(1) (Uplands Zone)

"Impervious cover may not exceed: (a) 20%; or (b) if development intensity is transferred under Section 25-8-455(Transfer of Development Intensity) 25%."

The applicant is requesting a modification to allow impervious cover up to 45% net site area in the Uplands Zone.

4. Exception from LDC 25-8-454(D)(2) (Uplands Zone)

"At least 40% of a site must be retained in or restored to its natural state to serve as a buffer, the buffer must be contiguous to the development, and the buffer must receive overland drainage. Use of the buffer is limited to fences, utilities that cannot be reasonably located elsewhere, irrigation lines not associated with wastewater disposal, and access for site construction."

The applicant is requesting a modification to allow for a minimum of 0% of the site to be retained in or restored to its natural state to serve as a buffer.

5. Exception from LDC 25-8-261 (Critical Water Quality Zone Development)

(A) A fence that does not obstruct flood flows is permitted in a critical water quality zone.
(B) a public or private park, golf course, or open spaces, other than a parking lot, is

permitted in a critical water quality zone if a program of fertilizer, pesticide, and herbicide use is approved by the Watershed Protection and Development Review Department. (1) In a water supply rural watershed or the Barton Springs Zone, park development is limited to hiking, jogging, or walking trails and outdoor facilities, and excludes stables and corrals for animals...(C) Along Lake Travis, Lake Austin, or Town Lake: (1) a boat dock, pier, wharf, or marina and necessary access and appurtenances, is permitted in a critical water quality zone, and (2) approval by the Watershed Protection and Development Review Department of chemicals used to treat building materials that will be submerged in water is required before a permit may be issued or a site plan released...(E) A utility line may cross a critical water quality zone. (F) Except in the Barton Springs Zone, detention basins and floodplain alterations are permitted in the critical water quality zone if the requirements of Chapter 25-7 (Drainage) and the other provisions of this subchapter are met."

The applicant is requesting a modification to allow for the construction of permeable pedestrian pavement, a vertical boat launch facility, a paved connection from the vertical lift to the boat storage, boat docks, drainage facilities, gas pump, outside seating areas, decking and the reconstruction of the restaurant within the Critical Water Quality Zone.

6. Exception from LDC 25-8-452 (Critical Water Quality Zone)

"Development is prohibited in a critical water quality zone, except as provided in Article 7, Division 1."

See Exception Number 5. This section of the LDC specifically addresses a water supply rural watershed.

7. Exception from LDC 25-8-301 (Construction of a Roadway or Driveway)

"(A) A person may not construct a roadway or driveway on a slope with a gradient of more than 15% unless the construction is necessary to provide primary access to: (1) at least two contiguous acres with a gradient of 15% or less; or (2) building sites for at least five residential units. (B) For construction described in this section, a cut or fill must be revegetated, or if a cut or fill has a finished gradient of more than 33%, stabilized with a permanent structure. This does not apply to a stable cut."

The applicant is requesting a modification to allow for the construction of a roadway or driveway on a slope with a gradient of more than 15%.

8. Exception from LDC 25-8-302 (Construction of Building or Parking Area)

"(A) A person may not construct: (1) a building or parking structure on a slope with a gradient of more than 25%; or (2) except for a parking structure, a parking area on a slope with a gradient of more than 15%. (B) A person may construct a building or parking structure on a slope with a gradient of more than 15% and not more than 25% if the requirements of this subsection are met. (1) Impervious cover on slopes with a gradient of more than 15% may not exceed 10% of the total area of the slopes. (2) The terracing techniques in the Environmental Criteria Manual are required for construction that is uphill

or downhill of a slope with a gradient of more than 15%. (3) Hillside vegetation may not be disturbed except as necessary for construction, and disturbed areas must be restored with native vegetation. (4) For construction described in this section, a cut or fill must be revegetated, or if a cut or fill has a finished gradient of more than 33%, stabilized with a permanent structure. This does not apply to a stable cut."

The applicant is requesting a modification to allow for construction of a building or parking structure on a slope with a gradient of more than 25%.

9. Exception from LDC 25-8-361(C) (Wastewater Restrictions)

"For a commercial development in a water supply rural watershed, a wastewater disposal area may not be located in the 40% buffer zone."

The applicant is requesting a modification to allow for a wastewater disposal area to be located in the 40% buffer zone.

10. Exception from LDC 25-8-361(F) (Wastewater Restrictions)

"(F) Wastewater treatment by land application is prohibited: (1) on a slope with a gradient of more than 15%; (2) in a critical water quality zone; (3) in a 100-year floodplain; or (4) during wet-weather conditions."

The applicant is requesting a modification to allow for a wastewater treatment by land applicant on a property with a slope gradient of more than 15%, located in a critical water quality zone, in a 100-year floodplain, and during wet weather conditions.

Recommendations

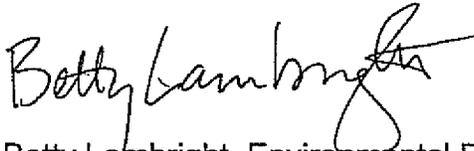
At this time, City staff cannot recommend approval of the PUD application based on the information submitted by the applicant. In addition to Environmental, Zoning, and Transportation concerns, the applicant may have outstanding issues with Parks and Fire. The Board of Directors of the two adjacent WCID properties oppose the proposed zoning, as Rule 290.41 of TAC Title 30 Chapter 290 does not allow marinas within 1000 feet of a public drinking water intake.

The Land Development Code (Chapter 25-2, Division 5) outlines the zoning regulations and submittal requirements for a Planned Unit Development. 25-2-411(D) states "The natural topography, soils, critical environmental features, waterways, and vegetation must be incorporated into the design of a PUD district, if practicable. Buffer zones and greenbelt areas are required. In intensively developed areas, landscaping that exceeds the minimum requirements of this title is required." It is the applicant's burden to provide sufficient information to show whether or not environmental considerations have been incorporated into the design of the PUD. As previously stated, the Applicant has not provided this information. In order for staff to fully evaluate the environmental ramifications of this project, the applicant will need to provide the following information in a timely manner:

1. Provide a slope map and Q1/Q2 tables, including existing impervious cover.

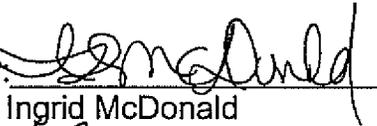
2. Provide an Environmental Assessment, as defined by 25-8-121.
3. Provide details concerning the proposed capture of 100,000 gallons of rainwater. What areas would contribute to this amount (roofs, parking, etc)? What is the proposed use of the captured rainwater? If it is strictly for landscaping, provide a water budget.
4. Obtain a Letter of Intent from the Green Building program that clarifies whether a one star or two star rating will be pursued.
5. Provide a copy of the IPM plan.
6. Provide details of the landscape buffer. What is the proposed width? Will there be a restriction against any buildings, drives, parking, etc in this buffer? Provide details of the type of vegetation to be planted in the landscape buffer.
7. Provide details of the gas storage, containment and delivery system, including location.

If you need further details, please contact me at 974-2696.

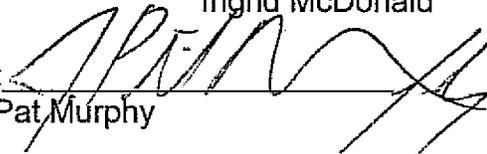


Betty Lambright, Environmental Review Specialist Sr.
Watershed Protection and Development Review

Environmental Program Coordinator:

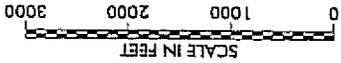

Ingrid McDonald

Environmental Officer:


Pat Murphy



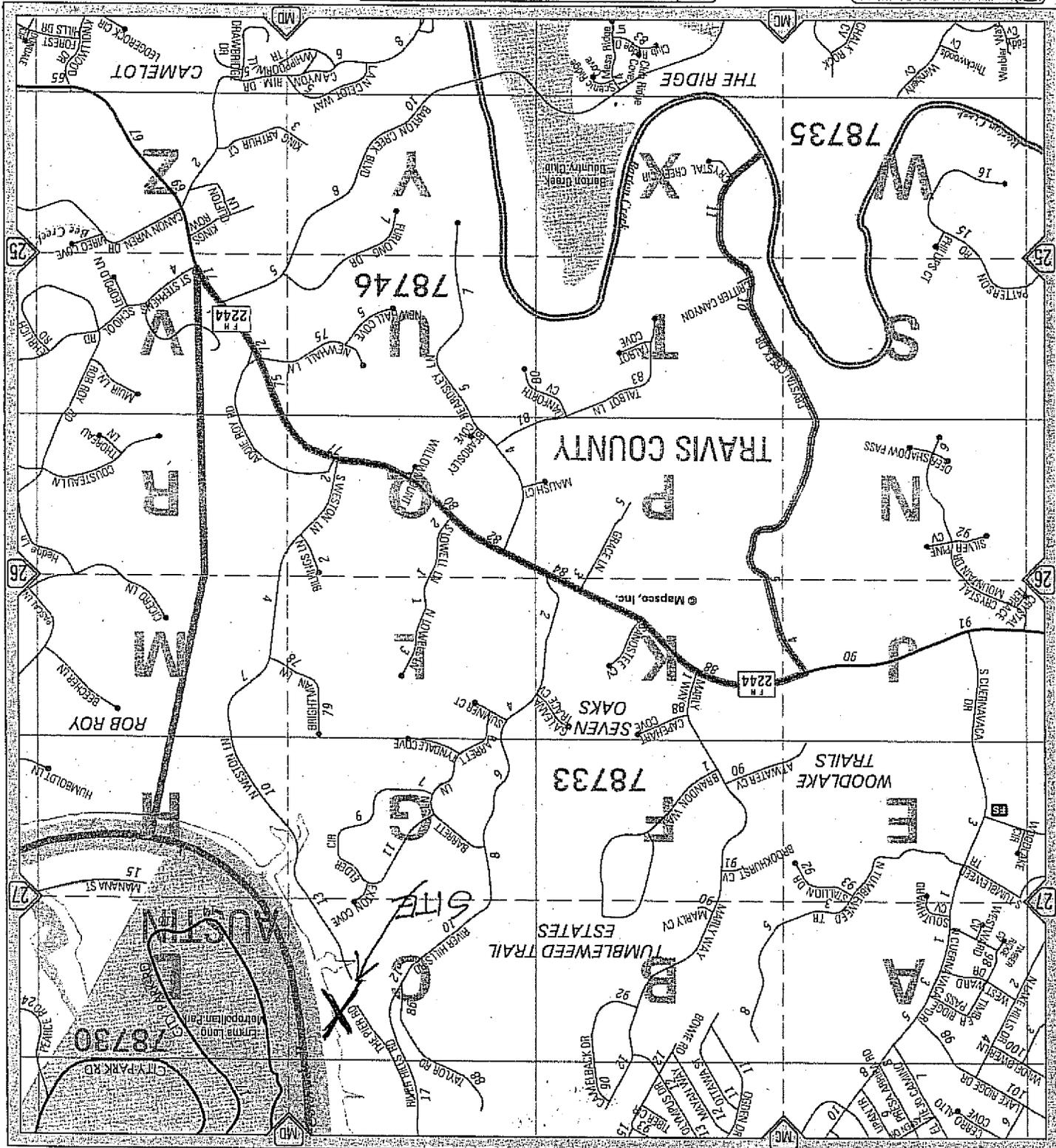
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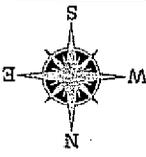
CONTINUED ON MAP 582

CONTINUED ON MAP 551



552 FROM CAPITAL OF TEXAS HIGHWAY, GO WEST ON RIVER HILLS RD. TURN RIGHT OFF RIVER HILLS RD. TO THE PIER RD.

CONTINUED ON MAP 522



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9, 8, 7, 6, 5, 4, 3, 2, 1

ZONING REVIEW SHEET**CASE:** C814-06-0202**Z.A.P. DATE:** May 15, 2007**ADDRESS:** 1703 River Hills Road**OWNER:** Pier Partners LP, (Eric Moreland)**AGENT:** Clark, Thomas & Winters, PC
(John Joseph)**REZONING FROM:** CS-1 (Commercial Liquor Sales) district and LA (Lake Austin Residence) district**TO:** PUD (Planned Unit Development)**AREA:** 10.315 Acres**ISSUES:**

This case has been scheduled on the Environmental Board agenda for May 16, 2007 as a Staff presentation.

SUMMARY STAFF RECOMMENDATION:

At this time, Staff cannot recommend approval of the PUD application based on the information submitted by the applicant. However, Staff recommends a postponement to June 19, 2007 to address pending environmental and transportation issues on the site and to allow the Environmental Board to review and recommend on the requested environmental variances.

DEPARTMENT COMMENTS:

The subject rezoning area consists of a 10.315 acre site including the once used Pier restaurant zoned CS-1 and LA divided into 3 tracts as depicted in the land use plan. Access to the property is via an existing private driveway off River Hills Road.

The existing facility, currently not in operation, consists of 2,559 square feet of restaurant for dining and indoor recreation, restroom facilities and kitchen; 5,400 square feet of outdoor uncovered dining; 707 of covered dining and deck adjacent to Lake Austin; 260 square feet of uncovered deck adjacent to Lake Austin; 18 boat stalls and refueling facilities and a stage with lighting and sound for live music entertainment.

The applicant proposes to rezone the property to PUD district to allow for commercial, retail, dry-stacked marina, and restaurant uses along with requested environmental variances. A 10,000 square feet restaurant is proposed along with a 25,000 square feet dry-stacked marina with a capacity for approximately 200 boats. Boat access to Lake Austin is proposed via a fork-lift system by which boats will be lowered onto the lake by way of designated access.

Specifically, the applicant requests the following:

1. Land uses:
 - Tract 1: All uses permitted and conditional in the GR – Community Commercial district;
 - Tract 2: All uses permitted and conditional in the GR – Community Commercial district with the addition of Marina and Recreational equipment Maintenance and Storage; and
 - Tract 3: No uses allowed;

For commercial land uses:

- Area: 4.136 acres;
- Maximum FAR: 0.06:1;
- Minimum lot size: 1 acre;
- Maximum building height: 45 feet;
- Setbacks:
 - Front yard: 25 feet;
 - Side street side: 25 feet;
 - Interior side yard: 8 feet;
- Maximum impervious cover: 50%;

For recreational equipment maintenance & storage and marina land uses:

- Area: 1.526 acres;
- Maximum FAR: 0.40:1;
- Total square footage: 25,000 square feet;
- Minimum lot size: 1 acre;
- Maximum building height: 60 feet;
- Setbacks:
 - Front yard: 25 feet;
 - Side street side: 25 feet;
 - Interior side yard: 20 feet;
 - Rear yard: 15 feet
- Maximum impervious cover: 65%;

2. Water quality requirements would be met through on-site water quality facilities, or other environmental mitigation methods approved by the City and adopted as a part of the PUD ordinance;
3. The project intends to be a Green Builder, provide Rainwater Harvesting and an Integrated Pest Management Plan;
4. Community Benefits.
 - Restaurant
 - (i) Family dining facilities — Indoor and outdoor, attracting patrons by vehicle and watercraft as well as pedestrian visitors;
 - Restroom Facilities — Deter pollution of the lake and reduce the potential for contamination.;
 - Indoor Live Music Venues;
 - Dry Boat Storage and Maintenance;
 - Employment Opportunity;
5. Community Aesthetics — This location has become known in the community and recognized by generations of Austinites as an Austin icon and a required visit by tourists and visitors to Lake Austin. The Pier has become synonymous with lake dining and musical entertainment. Few visits to Austin are complete without a burger and fries on the deck at the Pier;
6. Wastewater — Convert the existing septic drainfield to a system of current design and construction;

7. Fuel Storage — Provide for a fuel storage, containment, and delivery system that meets or exceeds city and state standards and place the storage facility in a location that is not adjacent to the lake;
8. The Proposed PUD results in development superior to conventional development that would be permitted under current zoning and subdivision regulations in the following ways:
 - Maximization of available resources;
 - Homogeneous multi-use facilities;
 - Contributions to storm water facilities;
 - Contributions to water quality facilities;
9. The Proposed PUD Enhances Preservation of the Natural Resources:
 - Rainwater;
 - Green Builder;
 - Herbicide and Pesticide Plan;
 - Landscape buffer between the Pier Development and adjoining properties;
 - Minimizes current runoff into Lake Austin;
 - The new gas storage facility will further protect the environmental quality of Lake Austin;
 - The Proposed PUD Encourages High Quality Development and Innovative Design; and
 - The Proposed PUD Ensures Adequate Public Facilities and Services.

The following is a list of requested variances by the applicant to be included in the Planned Unit Development, in accordance with LDC § 25-2-4 11(A):

1. Section 25-8-341(A) (Cut Requirements) is modified to allow for a cut of more than four feet in depth but not to exceed 20 feet in depth for the construction of a Recreational Equipment Maintenance and Storage Building.
2. Section 25-8-342(A) (Fill Requirements) is modified to allow for a fill of more than four feet in depth but not to exceed six feet in depth for the construction of landscaping berms.
3. Section 25-8-454(D)(1) (Uplands Zone) is modified to allow for impervious cover in excess of 20% but not to exceed 45% of the net site area of the property within the Uplands Zone which excludes one acre that is designated for use as a septic drain field.
4. Section 25-8-454(D)(2) (Uplands Zone) is modified to allow for a minimum of 0% of the site to be retained in or restored to its natural state to serve as a buffer.
5. Section 25-7-92(B) (Encroachment on Floodplain Prohibited) is modified to allow for the construction of water quality controls, a paved connection from the vertical lift to the boat storage, a portion of the drive and walkway serving the restaurant, boat docks, decking and the reconstruction of the restaurant within the 100-year floodplain.
6. Section 25-8-26 1 (Critical Water Quality Zone Development) is modified to allow for the construction of permeable pedestrian pavement, a vertical boat launch facility, a paved connection from the vertical lift to the boat storage, boat docks, decking and the reconstruction of the restaurant within the Critical Water Quality Zone.

7. Section 25-7-96 (Exceptions in the 25-Year Floodplain) is modified to allow for the construction of boat docks and decking within the 25-year floodplain and the reconstruction of the restaurant within, but raised above, the 25-year floodplain.
8. Section 25-6-Appendix A (Tables of Off-street Parking and Loading Requirements) is modified to require one (1) parking space for every four (4) boat slips within the Recreational Equipment Maintenance and Storage Building.
9. Section 25-2-1063 (Height Limitations and Setbacks for Large Sites) is modified to allow for a reduction in setback and height limitations as shown on the attached Land Use Plan.
10. Section 25-2-1067 (Design Regulations) is modified to allow for a parking area or driveway to be constructed within 25 ft. or less from a lot that is in an SF-S or more restrictive zoning district; or on which a use permitted in an SF-S or more restrictive zoning district is located.
11. Section 25-7-2 (Obstruction of Waterways Prohibited) is modified to allow for an obstruction in a waterway.
12. Section 25-7-152 (Dedication of Easements and Right-Of-Way) is modified to not require the owner to dedicate to the public an easement or right-of-way for a drainage facility, open or enclosed, and stormwater flow to the limits of the 100-year floodplain.

BACKGROUND

On September 13, 1984, the property was rezoned from "A"—Residence and "Interim LA" 1st height & area to "C-2" 1st height & area imposing conditions that subsequent requests for expansion or changes of the existing land use should be accompanied by a site plan and require approval of the Planning commission and City Council. (Please see Exhibit A).

On December 9, 2005, a rezoning case was filed for the same property under case C14-05-0211 which requested to rezone the property from CS-1 to CR (Community Recreation). The case was heard before the Zoning and Platting Commission on April 4, 2006 and postponed indefinitely at the request of the applicant. The case expired on October 4, 2006.

EXISTING ZONING AND LAND USES:

	ZONING	LAND USES
<i>Site</i>	CS-1/LA	Former Pier Restaurant / Undeveloped land
<i>North</i>	LA	Travis County Water Treatment Plant Expansion
<i>South</i>	LA	Travis County Water Treatment Plant Expansion
<i>East</i>	N/A	Lake Austin
<i>West</i>	LA	Undeveloped land

AREA STUDY: Lake Austin Area

TIA: Pending recommendation

WATERSHED: Lake Austin

DESIRED DEVELOPMENT ZONE: Yes

CAPITOL VIEW CORRIDOR: N/A

HILL COUNTRY ROADWAY: N/A

11

NEIGHBORHOOD ORGANIZATIONS:

153--Rob Roy Home Owners' Association Inc.
 243--River Hills Neighborhood Assn.
 434--Lake Austin Business Owners
 605--City of Rollingwood
 965--Old Spicewood Springs Rd. Neighborhood Assn.
 996--Bee Caves Road Alliance

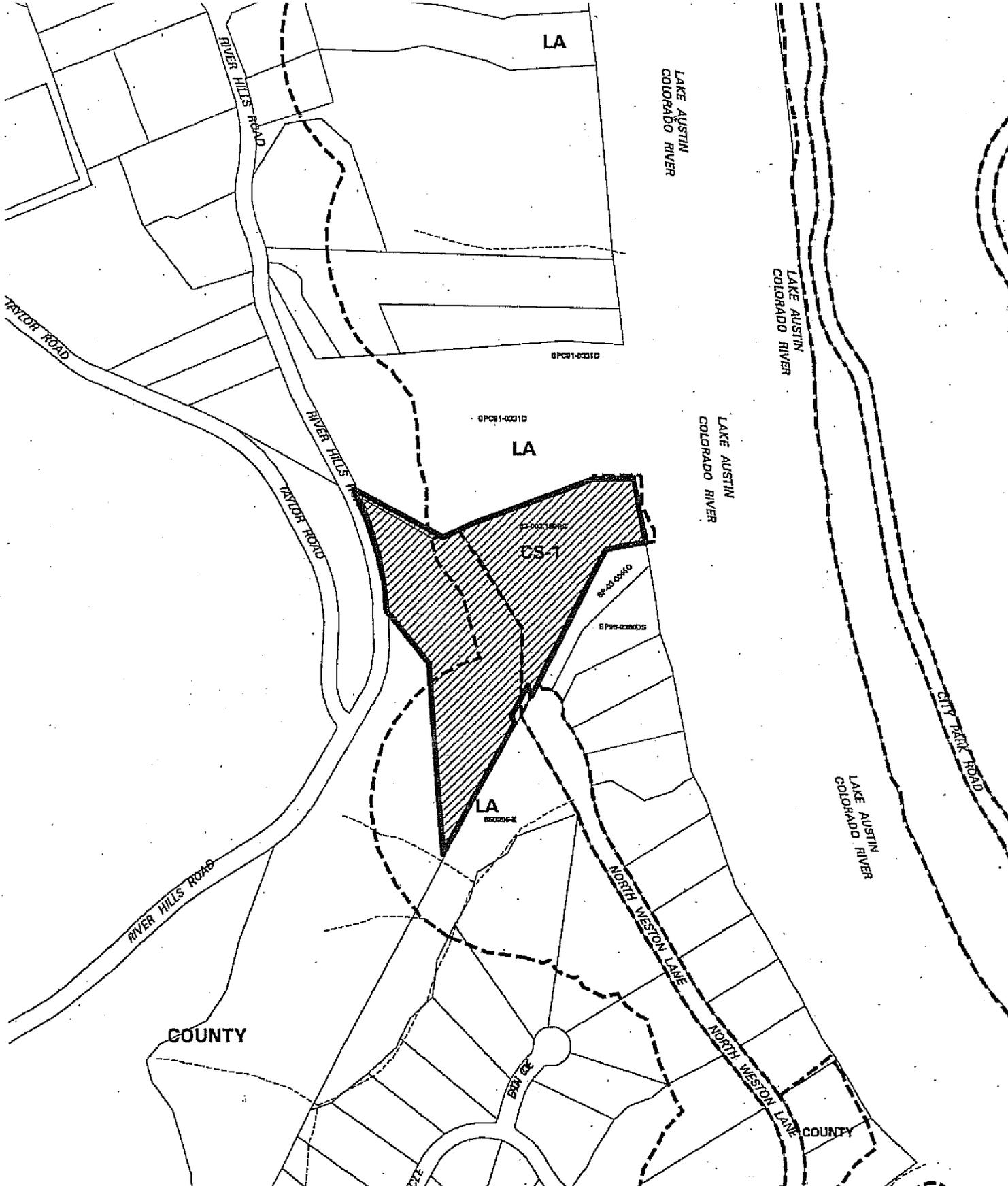
RELATED CASES:

NUMBER	REQUEST	COMMISSION	CITY COUNCIL
C14-83-003.189	"A" & "T-LA" 1 st H&A to "C-2" 1 st H&A.	03/20/84: Recommended granting to "C-2" 1 st H&A noting that subsequent requests for expansion or changes of the existing land use should be accompanied by a site plan and require approval of the Planning commission and City Council and "LA" 1 st H&A on balance. (8-0)	04/12/84: APVD C-2, 1ST H&A & LA ON BALANCE (5-0); 1ST RDG. 09/13/84: APVD LA, 1ST H&A; 3RD RDG.
C14-05-0211	CS-1 to CR	01/31/06: PP TO 3-7-06 BY CONSENT (STAFF); (8-0) 03/07/06: PP TO 4-4-06 (STAFF); (9-0) 04/04/06: PP INDEF (AP) (7-0)	N/A

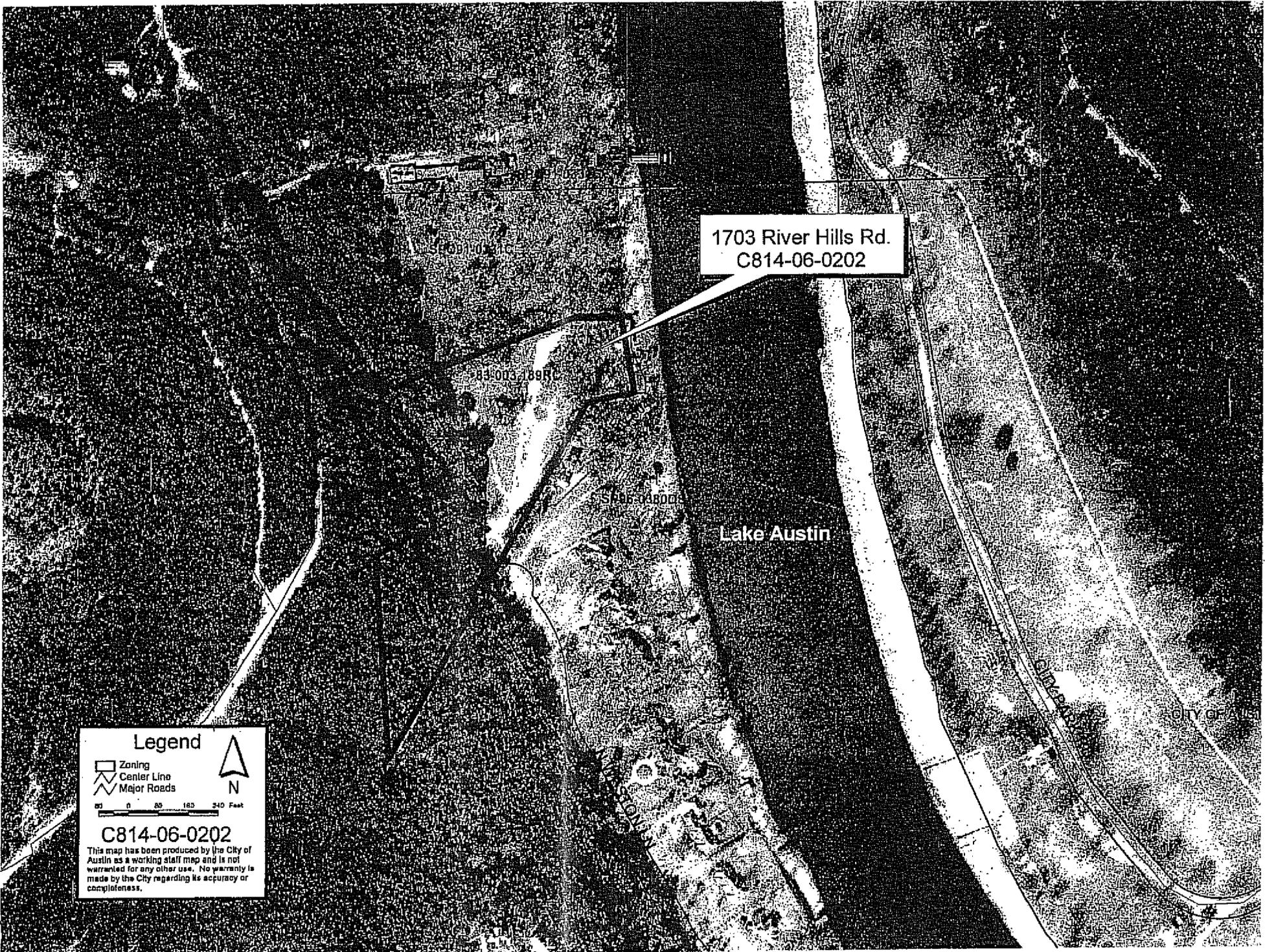
CASE HISTORIES: N/A**ABUTTING STREETS:**

NAME	ROW	PAVEMENT	CLASSIFICATION	SIDEWALKS	BICYCLE PLAN
River Hills Road	50'	Varies	Collector	No	No
Weston Lane	Varies	Varies	Collector	No	No

CITY COUNCIL DATE:**ACTION:****ORDINANCE READINGS:** 1st2nd3rd**ORDINANCE NUMBER:****CASE MANAGER:** Jorge E. Rousselin, NPZD**PHONE:** 974-2975**E-MAIL:** jorge.rousselin@ci.austin.tx.us



 1" = 400'	SUBJECT TRACT 	PLANNED UNIT DEVELOPMENT		CITY GRID REFERENCE NUMBER D27	
	PENDING CASE 	CASE #: C814-06-0202			
	ZONING BOUNDARY 	ADDRESS: 1703 RIVER HILLS RD			DATE: 06-10
	CASE MGR: J.ROUSSELIN	SUBJECT AREA (acres): 10.315			INTLS: SM



1703 River Hills Rd.
C814-06-0202

SP-06-08008

SP-06-08008

SP-06-08008

Lake Austin

CLARK BLVD

© City of Austin

Legend

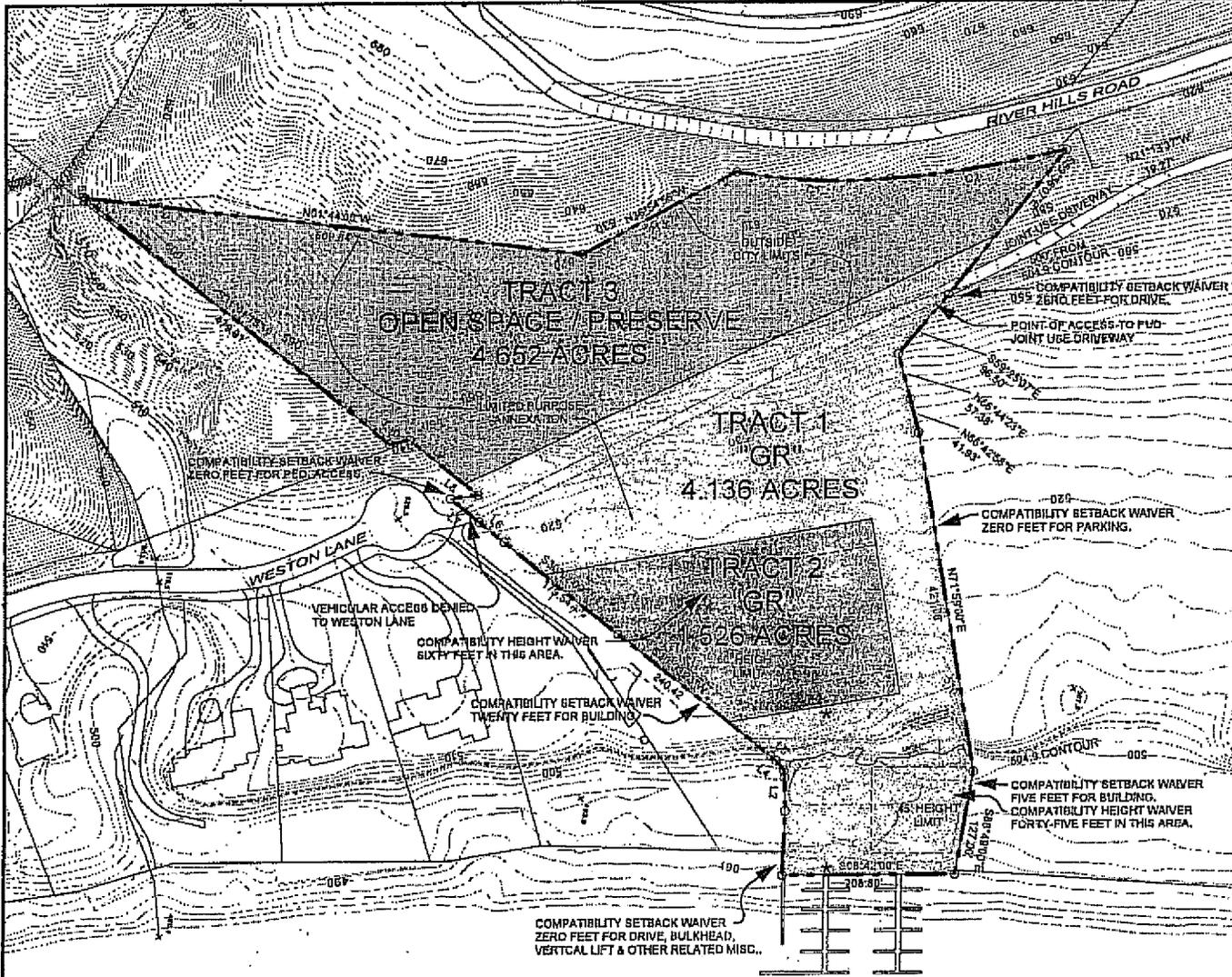
-  Zoning
-  Center Line
-  Major Roads

0 80 160 240 Feet

C814-06-0202

This map has been produced by the City of Austin as a working staff map and is not warranted for any other use. No warranty is made by the City regarding its accuracy or completeness.

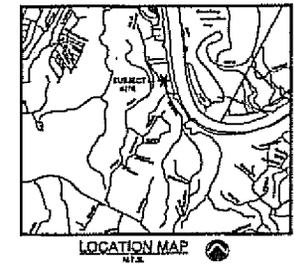
21



LINE TABLE	CURVE TABLE
L1 8077410W 78.12	C1 1012011W 0.00
L2 8077410W 41.22	C2 1012011W 0.00
L3 8077410W 6.20	C3 1012011W 0.00
L4 8077410W 11.20	C4 1012011W 0.00
L5 8077410W 8.12	C5 1012011W 0.00
L6 8077410W 28.12	C6 1012011W 0.00
L7 8077410W 45.11	C7 1012011W 0.00
L8 8077410W 34.80	C8 1012011W 0.00
L9 8077410W 48.11	C9 1012011W 0.00
L10 8077410W 28.80	C10 1012011W 0.00

* APPROXIMATE LOCATION OF FUEL PUMPS

LAKE AUSTIN



PIER PARTNERS, L.P.	
TOTAL AREA OF SITE	13,314 ACRES
TOTAL AREA OF PUD	13,314 ACRES
TOTAL AREA OF TRACT 1	4,136 ACRES
TOTAL AREA OF TRACT 2	526 ACRES
TOTAL AREA OF TRACT 3	4,652 ACRES

PERMITTED USES:
 ALL USES PERMITTED AND PROHIBITED WITHIN THE COMMUNITY DEVELOPMENT PLAN AND ZONING ORDINANCES.
RESTRICTIONS:
 ALL USES PERMITTED AND PROHIBITED WITHIN THE COMMUNITY DEVELOPMENT PLAN AND ZONING ORDINANCES.
NOTES:
 1. ALL USES PERMITTED AND PROHIBITED WITHIN THE COMMUNITY DEVELOPMENT PLAN AND ZONING ORDINANCES.

COMMERCIAL USES	
USE	MINIMUM LOT AREA
OFFICE	10,000 S.F.
RETAIL	10,000 S.F.
RESTAURANT	10,000 S.F.
TRADING	10,000 S.F.
WAREHOUSE	10,000 S.F.
INDUSTRIAL	10,000 S.F.
AGRICULTURE	10,000 S.F.
RECREATION	10,000 S.F.
OTHER	10,000 S.F.

- NOTES:**
1. THE FLOOD PLAIN TO BE DELEGATED WITHIN A DRAINAGE BASIN AT THE TIME OF SITE DEVELOPMENT PERMIT. THIS DOES NOT PRECLUDE THE LOCATION FOR ANY STRUCTURES WITHIN THE FLOOD PLAIN PROVIDED THAT THE FLOOD STUDY ALLOWS FOR LOTS TO BE PLACED IN THE FLOOD PLAIN. ALL HABITABLE STRUCTURES MUST BE LOCATED OUT OF THE FLOOD PLAIN IN ACCORDANCE WITH THE LAND DEVELOPMENT CODE.
 2. ALL ADDRESS ROADWAYS MUST BE A MINIMUM OF 20' UNOBSTRUCTED WIDTH WITH UNOBSTRUCTED THROUGH PAVEMENT OF 8" OUTSIDE AND 2" INSIDE FOR ALL TURNS.
 3. INCLUDE ON ALL ADDRESS ROADWAYS MUST NOT EXCEED 10% FOR A SMALL ROAD AND 5% FOR CONCRETE ROAD. MAXIMUM MAXIMUM GRADE CHANGE OR GRADE CHANGE WITHIN 20' SHALL NOT EXCEED 10%.
 4. A MATERIALS STORAGE CONSTRUCTION PLAN AND SPECIFICATION IS REQUIRED TO BE SUBMITTED TO THE CITY OF AUSTIN WITH A SITE PLAN SUBMITTAL.
 5. VEHICULAR ACCESS TO WESTON LANE IS PROVIDED. AN ACCESS WAY WILL BE PROVIDED TO ALLOW FOR FUTURE ACCESS FROM WESTON LANE TO THE PIER PARTNERS SITE.

Thruway Design
 LAND PLANNERS

LAND USE PLAN

THE PIER
 PIER ROAD
 AUSTIN, TEXAS

THE PIER
 P.U.D.
 PLAN

OVERALL

CLARK, THOMAS & WINTERS

A PROFESSIONAL CORPORATION

TELEPHONE (512) 472-8800

POST OFFICE BOX 1148
AUSTIN, TEXAS 78767

FAX (512) 474-1129

300 WEST 6TH STREET, 15TH FLOOR
AUSTIN, TEXAS 78701

April 25, 2007

City of Austin
Victoria Hsu, Director
Watershed Protection and Development Review Dept.
505 Barton Springs Road
Austin, Texas 78704

RE: Pier Partners Planned Unit Development Purpose Statement

Dear Ms. Hsu

The purpose of this correspondence is to provide a statement of the purpose for this Planned Unit Development "PUD", the proposed conceptual land use plan and site development regulations for the Pier Partners PUD land use plan and briefly discuss why the proposed PUD meets the applicable criteria set forth in the City of Austin Land Development Code "LDC" and should be approved by the City of Austin. As you are aware the Pier is an Austin and Lake Austin icon and I will refer to it as the Pier throughout. The Pier had been operated at this location serving as a restaurant and community gathering spot for live musical entertainment, dining, recreation and boat fueling for over 47 years.

The property that comprises the PUD is owned by The Pier Partners, LP and Embarcadero Partners, LP.

The Pier was originally opened to the public in 1958 at a time when food and entertainment services at this part of Lake Austin were non-existent.

The existing facility (not now in operation) consists of 2,559 sq. ft. of restaurant for dining and indoor recreation, restroom facilities and kitchen; 5,400 sq. ft. of outdoor uncovered dining; 707 of covered dining and deck adjacent to Lake Austin; 260 sq. ft. of uncovered deck adjacent to Lake Austin; 18 boat stalls and refueling facilities and a stage with lighting and sound for live music entertainment.

Since opening in 1958, the Pier has hosted live music by such great artists as Cross Canadian Ragweed, Leon Russell, Big Brother, & Holding Company to name a few and an untold number of local Austin musicians. During its 58 years of operation, "The Pier" became synonymous with live music in Austin.

The Pier values the relationship it has developed with the community and neighborhoods. The Pier is committed to working closely with its neighbors during this PUD process to ensure that the needs and concerns of the community are carefully considered and incorporated in the Pier plans for the future, to the extent possible. During this process, the Pier is committed to communicate regularly with its neighbors and neighborhood associations, to ensure that the community is aware of and involved in the PUD planning process.

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April 25, 2007
Page 2

I. Characteristics of the Proposed PUD.

The Pier proposes that the PUD have the following site development regulations and confer the following community benefits.

A. Site Development Regulations.

1. Development occurring under the PUD would comply with the LDC regulations and those regulations as set forth in the approved Land Use Plan as modified by the PUD ordinance.

2. Land-Uses within the PUD will be those allowed in these specific zoning categories with the following specific uses prohibited:

Tract 1 – All uses permitted and conditional with “GR” *ALL GR*
Community Commercial.

Tract 2 – All uses permitted and conditional with “GR”
Community Commercial plus marina and recreation equipment
maintenance & storage

3. Water quality requirements would be met through on-site water quality facilities, or other environmental mitigation methods approved by the City and adopted as a part of the PUD ordinance.

4. The project intends to be a Green Builder, provide Rainwater Harvesting and an Integrated Pest Management Plan.

B. Community Benefits.

1. Restaurant

(i) Family dining facilities – Indoor and outdoor, attracting patrons by vehicle and watercraft as well as pedestrian visitors.

2. Restroom Facilities – Deter pollution of the lake and reduce the potential for contamination.

April 25, 2007
Page 3

3. Indoor Live Music Venues

4. Dry Boat Storage and Maintenance

5. Employment Opportunity

6. Community Aesthetics – This location has become known in the community and recognized by generations of Austinites as an Austin icon and a required visit by tourists and visitors to Lake Austin. The Pier has become synonymous with lake dining and musical entertainment. Few visits to Austin are complete without a burger and fries on the deck at the Pier.

7. Wastewater – Convert the existing septic drainfield to a system of current design and construction.

8. Fuel Storage – Provide for a fuel storage, containment, and delivery system that meets or exceeds city and state standards and place the storage facility in a location that is not adjacent to the lake.

II. The Proposed PUD Conforms to the Purposes of Sec. 25-2-174 of the Land Development Code of the City of Austin

A. The Proposed PUD Provides “Greater Design Flexibility for Development with the PUD”

1. The PUD zoning would address the ever changing needs of the community indefinitely at the current location and deter the pressure for the proliferation of fueling facilities and in-water boat storage facilities on the lake.

B. The Proposed PUD results in development superior to conventional development that would be permitted under current zoning and subdivision regulations

1. Maximization of available resources
2. Homogeneous multi-use facilities
3. Contributions to storm water facilities
4. Contributions to water quality facilities

C. The Proposed PUD Enhances Preservation of the Natural Resources.

April 25, 2007
Page 4

1. Rainwater
2. Green Builder
3. Herbicide and Pesticide Plan
4. Landscape buffer between the Pier Development and adjoining properties
5. Minimizes current runoff into Lake Austin
6. The new gas storage facility will further protect the environmental quality of Lake Austin

D. The Proposed PUD Encourages High Quality Development and Innovative Design.

E. The Proposed PUD Ensures Adequate Public Facilities and Services

For the above-mentioned reasons, the applicant respectfully requests a PUD zoning base district for the subject site and believes that aforementioned statement of purpose justifies the PUD land use designation. If you should have any questions regarding this matter, please do not hesitate to call.

Very truly yours,



John M. Joseph

Cc: Pier Partners, LP
Attention:
Ron Thrower

JMJ:ck #16144-1
S:\mjt\wd proc\pier partners\purpose statement

CLARK, THOMAS & WINTERS

A PROFESSIONAL CORPORATION

TELEPHONE (512) 472-8800

POST OFFICE BOX 1148
AUSTIN, TEXAS 78767

FAX (512) 474-1129

300 WEST 6TH STREET, 15TH FLOOR
AUSTIN, TEXAS 78701

April 25, 2007

John. M. Joseph
(512) 495-8895
jmj@ctw.com

Mr. Jorge E. Rousselin, Case Manager
City of Austin
Neighborhood Planning & Zoning Department
505 Barton Springs Road, 5th Floor
Austin, Texas 78704

RE: Case No.: C814-06-0202
Project: The Pier Partners (1703 River Hills Road)
Applicant: Pier Partners, L.P.

Dear Mr. Rousselin:

The following is a list of requested variances to be included in the Planned Unit Development, in accordance with LDC § 25-2-411(A):

1. Section 25-8-341(A) (*Cut Requirements*) is modified to allow for a cut of more than four feet in depth but not to exceed 20 feet in depth for the construction of a Recreational Equipment Maintenance and Storage Building.
2. Section 25-8-342(A) (*Fill Requirements*) is modified to allow for a fill of more than four feet in depth but not to exceed six feet in depth for the construction of landscaping berms.
3. Section 25-8-454(D)(1) (*Uplands Zone*) is modified to allow for impervious cover in excess of 20% but not to exceed 45% of the net site area of the property within the Uplands Zone which excludes one acre that is designated for use as a septic drain field.
4. Section 25-8-454(D)(2) (*Uplands Zone*) is modified to allow for a minimum of 0% of the site to be retained in or restored to its natural state to serve as a buffer.
5. Section 25-7-92(B) (*Encroachment on Floodplain Prohibited*) is modified to allow for the construction of water quality controls, a paved connection from the vertical lift to the boat storage, a portion of the drive and walkway serving the restaurant, boat docks, decking and the reconstruction of the restaurant within the 100-year floodplain.

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April 25, 2007
Page 2

6. Section 25-8-261 (*Critical Water Quality Zone Development*) is modified to allow for the construction of permeable pedestrian pavement, a vertical boat launch facility, a paved connection from the vertical lift to the boat storage, boat docks, decking and the reconstruction of the restaurant within the Critical Water Quality Zone.
7. Section 25-7-96 (*Exceptions in the 25-Year Floodplain*) is modified to allow for the construction of boat docks and decking within the 25-year floodplain and the reconstruction of the restaurant within, but raised above, the 25-year floodplain.
8. Section 25-6-Appendix A (*Tables of Off-street Parking and Loading Requirements*) is modified to require one (1) parking space for every four (4) boat slips within the Recreational Equipment Maintenance and Storage Building.
9. Section 25-2-1063 (*Height Limitations and Setbacks for Large Sites*) is modified to allow for a reduction in setback and height limitations as shown on the attached Land Use Plan.
10. Section 25-2-1067 (*Design Regulations*) is modified to allow for a parking area or driveway to be constructed within 25 ft. or less from a lot that is in an SF-5 or more restrictive zoning district; or on which a use permitted in an SF-5 or more restrictive zoning district is located.
11. Section 25-7-2 (*Obstruction of Waterways Prohibited*) is modified to allow for an obstruction in a waterway.
12. Section 25-7-152 (*Dedication of Easements and Right-Of-Way*) is modified to not require the owner to dedicate to the public an easement or right-of-way for a drainage facility, open or enclosed, and stormwater flow to the limits of the 100-year floodplain.

If you need any additional information, please do not hesitate to contact me.

Very truly yours,



John M. Joseph

CLARK, THOMAS & WINTERS
A PROFESSIONAL CORPORATION

April 25, 2007
Page 3

CC: Mr. Brian A. Bailey, Pier Partners, L.P.
Mr. H.M. "Mac" Pike, Jr., Pier Partners, L.P.
Mr. Eric Moreland, Pier Partners, L.P.
Mr. Ron Thrower, Thrower Designs
Mr. Kevin Flahive, Clark, Thomas & Winters, P.C.

Rousselin, Jorge

From: Terry Barnes [REDACTED]
Sent: Tuesday, May 08, 2007 8:59 AM
To: Rousselin, Jorge
Subject: Case C814-06-0202 Second required street access point.

Mr. Rousselin,

City transportation staff comment TR15 states "For the subdivision, new subdivisions must have at least two access streets, and each must connect to a different external street, unless otherwise approved by the Director. LDC, 25-4-157 (B). As I have stated before in reference to this case the second proposed access street named Weston Lane is a private road. No access for use of this road by the applicants has been granted by the owners of this private road. Weston Lane is incorrectly depicted on city transportation maps as an arterial roadway and public access. Weston lane is gated at it's entrance with access granted to homeowners only via code, the end of Weston Lane is also gated and padlock keyed to emergency service personal only. Weston lane and it's tributary streets have never been turned over to Travis county. Weston lane enjoys it's private status and it's maintenance is the responsibility of the residential homeowners that it serves via the homeowners association that own it. It is not a access road that will service a commercial endeavor that is beyond the surveyed plat of our subdivision.

For the proposed zoning hearing I wish to make it clear that the Pier tract has not been granted a second road access point as required by LDC 25-4-157.

Thank for your consideration
Terry Barnes
1409 N Weston Lane
Austin, TX

5/8/2007

23

TRAVIS COUNTY WATER CONTROL AND
IMPROVEMENT DISTRICT NO. 20

9511 Ranch Road 620 North
Austin, Texas 78726

RECEIVED

December 4, 2006

DEC 05 2006

**VIA CERTIFIED MAIL
RETURN RECEIPT REQUESTED**

Neighborhood Planning & Zoning

City of Austin
c/o Watershed Protection and Development Review Department
505 Barton Springs Road
Austin, Texas 78704

Attention: Jorge Rousselin, Case Manager

Re: The Pier Property; Case No. C814-06-0202

Ladies and Gentlemen:

We are writing you as the Board of Directors of Travis County Water Control and Improvement District No. 20 (the "District"). The District provides potable water service to homes with a total estimated population of 1,100 persons adjacent to the subject property known as the Pier. The District owns the lot adjacent to and downstream of the Pier. The District's lot is the location of the District's water treatment plant. The District's raw water intake structure is located four lots further downstream from the water treatment plant.

The District's Board of Directors has taken action in open session to oppose this application by the Pier for a planned unit development ("PUD") and to oppose the waiver of compatibility standards. The District urges the City of Austin to deny the request for this development.

The District's raw water intake facility is approximately 800 feet downstream of the Pier. At the time the District constructed its facilities and until recently, the Pier provided docking for approximately 19 boats. In 1983, the District's developers applied for and received approval of an exception to allow its facilities within 1,000 feet of gasoline facilities. Based upon the limited use of the Pier's boating activities at that time, the District's engineer and the staff of the Texas Health Department, concluded that the exception was reasonable.

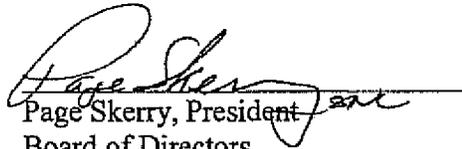
The development proposed by Pier Partners, L.P. includes dry docking of approximately 200 boats, and, the fueling of those boats from a new proposed gasoline storage facility. The

planned development, in the District's opinion, would create a potentially hazardous and substantial source of contamination of the District's public drinking water supply.

For these reasons, the Board of Directors respectfully requests the City's Boards and Commissions and City Council deny this PUD request.

Very truly yours,

By:


Page Skerry, President
Board of Directors

cc: Terry Barnes
1409 N. Weston Lane
Austin, TX 78733

Pier Partners, L.P.
c/o Kelly Cannon
Clark Thomas & Winters
P.O. Box 1148
Austin, TX 78767

Hamp Skelton
P.O. Box 1609
Austin, TX 78767-1609

TRAVIS COUNTY MUNICIPAL UTILITY DISTRICT NO. 4
9511 Ranch Road 620 North
Austin, Texas 78726

December 11, 2006

**VIA CERTIFIED MAIL
RETURN RECEIPT REQUESTED**

City of Austin
c/o Watershed Protection and Development Review Department
505 Barton Springs Road
Austin, Texas 78704

Attention: Jorge Rousselin, Case Manager

Re: The Pier Property; Case No. C814-06-0202

Ladies and Gentlemen:

We are writing you as the Board of Directors of Travis County Municipal Utility District No. 4 (the "District"). The District serves as the Master District for the seven Travis County Municipal Utility District Nos 3-9 and provides potable water service to homes with a total estimated current population of approximately 2,200 persons. The District will also begin in 2007 providing water service to a new retirement and long-term care facility for the elderly located within the District's service area. The safety of the water supply is of utmost importance. The District's raw water intake structure is located approximately 700 feet upstream from the Pier property.

The District's Board of Directors has taken action in open session to oppose this application by the Pier for a planned unit development ("PUD") and to oppose the waiver of compatibility standards. The District urges the City of Austin to deny the request for this development.

As stated above, the District's raw water intake facility is approximately 700 feet upstream of the Pier. The development proposed by Pier Partners, L.P. includes dry docking of approximately 200 boats, and, the fueling of those boats from a new proposed gasoline storage facility. The planned development, in the District's opinion, would create a potentially hazardous and substantial source of contamination of the District's public drinking water supply. It is not unusual for wind conditions and lack of water release at downstream dams to allow water and debris to travel upstream for limited distances.

For these reasons, the Board of Directors respectfully requests the City's Boards and Commissions and City Council deny this PUD request.

Very truly yours,

By: 
Bill Dukes, President
Board of Directors

cc: Pier Partners, L.P.
c/o Kelly Cannon
Clark Thomas & Winters
P.O. Box 1148
Austin, TX 78767

Terry Barnes
1409 N Weston Ln
Austin, TX 78733

December 13, 2006

Mr. Jorge Rousselin
City of Austin Neighborhood Planning and Zoning Dept
P.O. Box 1088
RE: C814-06-0202

Austin, TX 78767

Dear Mr. Rousselin,

The new Pier owners wish to construct a dry dock boat storage building for 185+ boats on Lake Austin at the old Pier restaurant location complete with a marina at the water. City staff during a previous zoning application (C14-05-0211) moved to approve their application before it went before the zoning commission. The Parks and Recreation board wrote a resolution in support of the proposed facility as well. When the application went before the zoning commission April 4, 2006 the applicants moved for a postponement in order to revise their application before it was to be considered by the zoning commission. It is now returning to you under application number C814-06-0202.

It is my understanding that under Title 30 of the Texas Administrative Code "Raw water intakes shall not be located within 1,000 feet of boat launching ramps, marinas, docks, or floating fishing piers which are accessible by the public."¹ Water District #20's raw water intake measures on a city plat map, approximately 780 feet to the South from the gas dock and Stratus Properties raw water intake is approximately 680 feet to the North of the gas dock. Water District #20's board has opposed the redevelopment of the Pier in a letter to the City of Austin Feb 14, 2006.

The marina and fuel sales at the Pier location were in a grand fathered zoning environment that use was non-conforming for its current zoning. I find gas service and marina service unacceptable to continue under variance or waiver since the use of all of the marina type docks and structures have become "abandon" as defined by City of Austin inactivity standard of 90 consecutive days². The restaurant has been closed since Oct of 2005 and a locked gate has been constructed blocking vehicle access by road. Service of all types has ceased. Video of the zoning commissions public hearing shows city staff affirming to the zoning commission that the marina use had become abandon during the public hearing on April 4, 2006. "A person may not resume an abandoned non-conforming use."³

Their desire to build a new restaurant, have boat storage and become a public tourist recreation area will surely fall under the restrictions mandated by State law. I would plea that no further wavier or variance for this type of operation adjacent to two large public water districts be granted or continued. I wish to respectfully request the zoning review department staff move for a disapproval based upon the above facts of law.

Thank you

Terry Barnes

¹ Texas Administrative Code Title 30, Part 1, Chapter 290, Subchapter D, Rule 290.41, Subchapter (e)

² City of Austin Land development code 25-2-945 sub (A) (2)

³ City of Austin Land development code 25-2-945 sub(C)

Rousselin, Jorge

From: Lewis Talbert [REDACTED]
Sent: Friday, November 17, 2006 11:33 AM
To: Rousselin, Jorge
Subject: Opposition to adding a drystack marina at the Pier

November 15, 2006

Mr. Jorge Rousselin; City of Austin Neighborhood Planning and Zoning Dept

RE: C814-06-0202 'The Pier Property'

Dear Jorge;

I am a Lake Austin Property owner. I have had many discussions with several property owners on Lake Austin, all who are opposed to the development of this site as planned. Adding another Marina to an already overcrowded lake is in no one's best interest.

The plan as it stands adds significantly to the congestion on the lake, and it requires you to bend or ignore many city codes in order to allow them to do that. I understand there are many outstanding issues with zoning, water supply impact, expired grandfathered use, access, fire codes, water availability, noise, gasoline service, building height, impervious cover, minimum acreage requirements, and many other issues.

My group of Lake Austin residents will be watching this development closely to make sure the city officials follow all aspects of the zoning in place. We have discussed the project with legal council and will be actively interested in each stage of its progress.

Since this development affects the lake itself, all lake residents need to be notified of any zoning requests, meetings, or modifications to this site. I am sure hundreds of residents will show up to dispute any development that makes this lake more crowded and more dangerous.

Could you please add this letter to the file for this development, and add me to this list of people requesting to be contacted regarding any action on this property. I would like to be notified of any further action on this development.

Thank you;

5/10/2007

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Lewis Talbert

[REDACTED]

5/10/2007

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Rousselin, Jorge

From: Nan Beebe [REDACTED]
Sent: Tuesday, November 28, 2006 6:52 PM
To: Rousselin, Jorge
Subject: Pier property

Re: C814-06-0202

Dear Mr. Rousselin,

I am a home owner on Lake Austin and am writing to you in reference to the proposed development of the Pier property on River Hills Road. Like most of my neighbors, I am extremely concerned about the impact that this proposal could have on the safety of Lake Austin which is already very crowded as well as the tremendous increase in traffic on River Hills Road. A group of concerned residents recently attended a city council meeting with the environmental board and were given several recommendations as to which group has "authority" in this matter, but it was very unclear who has jurisdiction, especially when the list of issues includes, safety, zoning, water intake, etc., not to mention the dangerous road conditions already on River Hills Rd., which will only increase.

As a mother of 3 children that love to swim in the lake, my concern is for safety primarily. We already have one Lake Travis. (How many deaths just last summer?) Let's keep Lake Austin safe. Let's keep Lake Austin pristine.

Please include my letter in the case file for C814-06-0202.

sincerely,
Nan Beebe

[REDACTED]
Austin, TX 78733

...manage your diabetes with style
www.BeticBag.com

Rousselin, Jorge

From: Terry Barnes [REDACTED]
Sent: Tuesday, May 08, 2007 8:59 AM
To: Rousselin, Jorge
Subject: Case C814-06-0202 Second required street access point.

Mr. Rousselin,

City transportation staff comment TR15 states "For the subdivision, new subdivisions must have at least two access streets, and each must connect to a different external street, unless otherwise approved by the Director, LDC, 25-4-157 (B)." As I have stated before in reference to this case the second proposed access street named Weston Lane is a private road. No access for use of this road by the applicants has been granted by the owners of this private road. Weston Lane is incorrectly depicted on city transportation maps as an arterial roadway and public access. Weston lane is gated at it's entrance with access granted to homeowners only via code, the end of Weston Lane is also gated and padlock keyed to emergency service personal only. Weston lane and it's tributary streets have never been turned over to Travis county. Weston lane enjoys it's private status and it's maintenance is the responsibility of the residential homeowners that it serves via the homeowners association that own it. It is not a access road that will service a commercial endeavor that is beyond the surveyed plat of our subdivision.

For the proposed zoning hearing I wish to make it clear that the Pier tract has not been granted a second road access point as required by LDC 25-4-157.

Thank for your consideration
Terry Barnes

[REDACTED]
Austin, TX

5/10/2007

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Rousselin, Jorge

From: Terry Barnes [REDACTED]
Sent: Tuesday, April 03, 2007 1:18 PM
To: Rousselin, Jorge
Subject: The Pier tract C814-06-0202

Mr. Rousselin

I am trying to get an update on the Pier tract application. It is my understanding from the City's web site that their return update has so far been rejected by environmental and the transportation department. First question is have they returned with a remedy for the lack of 250 acres required for a PUD? I am also trying to see if the letters that the two water districts wrote in opposition to this application are still on file in the correct case and are not dropped for consideration during an update process. Can you advise or meet with me in person for an update?

Thanks in advance

Terry Barnes

Terry Barnes
1409 N Weston Ln
Austin, TX 78733

May 10, 2007

Mr. Jorge Roussefin
City of Austin Neighborhood Planning and Zoning Dept
P.O. Box 1088
RE: C814-06-0202

Austin, TX 78767

Dear Mr. Roussefin,

The new Pier owners wish to construct a dry dock boat storage building for 185+ boats on Lake Austin at the old Pier restaurant location complete with a marina at the water. City staff during a previous zoning application (C14-05-0211) moved to approve their application before it went before the zoning commission. The Parks and Recreation board wrote a resolution in support of the proposed facility as well. When the application went before the zoning commission April 4, 2006 the applicants moved for a postponement in order to revise their application before it was to be considered by the zoning commission. It is now returning to you under application number C814-06-0202.

It is my understanding that under Title 30 of the Texas Administrative Code "Raw water intakes shall not be located within 1,000 feet of boat launching ramps, marinas, docks, or floating fishing piers which are accessible by the public."¹ Water District #20's raw water intake measures on a city plat map, approximately 780 feet to the South from the gas dock and Stratus Properties raw water intake is approximately 680 feet to the North of the gas dock. Water District #20's board has opposed the redevelopment of the Pier in a letter to the City of Austin Feb 14, 2006.

The marina and fuel sales at the Pier location were in a grand fathered zoning environment that use was non-conforming for its current zoning. I find gas service and marina service unacceptable to continue under variance or waiver since the use of all of the marina type docks and structures have become "abandon" as defined by City of Austin inactivity standard of 90 consecutive days². The restaurant has been closed since Oct of 2005 and a locked gate has been constructed blocking vehicle access by road. Service of all types has ceased. Video of the zoning commissions public hearing shows city staff affirming to the zoning commission that the marina use had become abandon during the public hearing on April 4, 2006. "A person may not resume an abandoned non-conforming use."³

Their desire to build a new restaurant, have boat storage and become a public tourist recreation area will surely fall under the restrictions mandated by State law. I would plea that no further wavier or variance for this type of operation adjacent to two large public water districts be granted or continued. I wish to respectively request the zoning review department staff move for a disapproval based upon the above facts of law.

Thank you

Terry Barnes

¹ Texas Administrative Code Title 30, Part 1, Chapter 290, Subchapter D, Rule 290.41, Subchapter (e)

² City of Austin Land development code 25-2-945 sub (A) (2)

³ City of Austin Land development code 25-2-945 sub(C)

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Rousselin, Jorge

From: Terry Barnes [REDACTED]
Sent: Friday, November 17, 2006 10:31 AM
To: Rousselin, Jorge
Subject: C814-06-0202 The Pier Marina use.

Attachments: C814_06_0202.doc



C814_06_0202.doc
(35 KB)

Mr. Rousselin

Please insert the attached word document to case file #C814-06-0202. It concerns the placement of a marina adjacent to raw water intakes. State law prohibits this under Texas administrative code title 30 and there are raw water intakes to the North and South of the subject property applying for a rezoning. There is no way to develop in a manner that will not result in a violation of this rule. Movement in either direction just makes separation worse for one or the other.

Thank you for your consideration

Terry Barnes

Rousselin, Jorge

From: Terry Barnes [REDACTED]
Sent: Monday, November 06, 2006 2:14 PM
To: Rousselin, Jorge
Subject: Embarcadero as related to the Pier project.

Mr. Rousselin

The link below will take you to the marketing web site for the Embarcadero project (C81-06-0506) on River Hills road. This tract abuts the Pier property (C814-06-0202). It appears as only a development assessment has been filed but the owners are currently offering the tracts for sale, or it appears that way from their web site. The Embarcadero project is from the Sutton Company of Austin.(<http://www.suttoncompany.com/>) The Sutton Company is also one of the owners of the Pier project, as is Eric Moreland. Mr. Moreland is the real estate firm representing the Embarcadero project.

The two projects are in concert with each other although not at first evident, and marketing strategy and lot price are driven as having Lake Austin access, complete with boat storage stalls for each new homeowner. I would plea that consideration be given to the development of land along Lake Austin not circumvent the zoning process as to how boat docks and marinas are placed only to find out later that the true motives were to inflate the land prices of land that normally does not have waterfront access.

In viewing the Embarcadero web site they have an error in programing, in order to fully view the page it needs to be displayed in a very large window in order for the links to navigate the site to be view able at the bottom of their home page. These links take you to their story line, lot plans and real estate contact.

<http://www.embarcaderoaustin.com/>

Terry Barnes

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WATER TREATMENT PLANT 4 PROJECT

Status Report

March 2007

This report summarizes key issues and activities recently completed for the Water Treatment Plant 4 (WTP 4) Project and presents upcoming tasks to be completed.

Issue Resolution

The following list highlights key issues addressed through the Environmental Commissioning (EC) process for the WTP 4 Project.

Issue	Resolution
Review EC costs.	Time and cost estimates for EC work (consultant, WPDRD monitoring, project management) were carefully reviewed for efficiency and effectiveness. EC consultant cost estimate was reduced from \$5.75 million to \$3.4 million. Monitoring costs were reduced from \$3.4 million to \$2.1 million. Total EC cost estimate was reduced from \$11.9 million to \$7.4 million.
Design permanent and/or temporary stormwater controls to prevent sediment discharge during construction and provide best management approach during operation.	Design is underway with design consultants, WPDRD Review and Water Quality Engineering staff collaborating on designs.
Environmental Commissioning (EC) RFQ scope and conflict of interest.	RFQ was withdrawn in February and re-issued in March. LEED, efficiency related, and construction phase work was removed or reduced and conflict of interest provisions clarified.
EC Checklist to assist design staff in identifying key facility and treatment process environmental issues.	Several meetings held to finalize checklist and ensure that it is well understood and user friendly.
Draft Lime Residuals Technical Memorandum TM .	WPDRD staff reviewed and provided comments to design team on TM evaluating options for water softening and managing lime residuals disposal or reuse. Final TM is pending.
Facility layout and environmental protection.	WPDRD setup workshop to be held in April with Conservation Design expert Randall Arendt to develop facility layout that addresses technical, engineering, and environmental constraints.
Stormwater monitoring.	Installation of stormwater monitoring equipment was completed and should be operational for April.

Schedule

Preliminary design is underway and detailed design is scheduled to begin in the second half of 2007. The project is currently on schedule to meet the startup deadline of Summer 2013.

The EC RFQ was reissued in March and submittals are due April 23. Review of submittals should be completed in May with a recommendation to go to Council for approval on June 7 or earlier. It is hoped the EC agent will be under contract and prepared to begin work by the first week of July.

The initial construction will be for the permanent storm water ponds for the project. Design on these controls is underway. Anticipated construction on this phase of the project is for work to begin in October 2007 (after bird nesting season).

Environmental Commissioning

Recent Activities

- The Mitigation Working Group, comprised of representatives from Austin Water Utility (AWU), Watershed Protection and Development Review (WPDRD), Public Works (PU), and others has been meeting regularly since July 2006 to implement the Environmental Commissioning process for WTP 4. This group continues to meet to discuss global project issues.
- The Environmental Commissioning Team began meeting regularly to discuss and address environmental issues per the defined EC process.
- Surface water and salamander monitoring began in December 2006 as part of the effort to define baseline environmental conditions.
 - Mark and recapture was the focus of the March 2007 salamander monitoring effort.
 - Surface water monitoring staff assessed water chemistry at 3 sites and initial stream habitat assessments were completed.
- WPDRD staff monitored the geotechnical borings, which were completed on the plant property. Data will be available in April. All drilling fluid was lost in each hole due to karst geology. However, as a result of the EC process water from Bull Creek was used as a drilling fluid and no bentonite or other additives were used in the fluid.
- The initial dye tracing results began to be received in March. Only 1 site showed a very small amount of dye. After receiving the remaining data, staff will determine whether additional tracing efforts are needed.
- Negotiations began with RMT, Inc. to begin development of threshold toxic effects levels for the salamander and bird species of concern. Because this information is likely to be needed before the EC consultant will be under contract in July, RMT is being asked to provide this work in the meantime.
- In late March consultants to the design group found *Rhadine persephone*, the Tooth Cave ground beetle, in a Critical Environmental Feature (CEF) on the plant site. The city will be working with the US Fish & Wildlife Service to protect the habitat for the beetle.

Upcoming Activities

- Hold facility layout workshop on April 17 with key design and EC staff.
- Surface water and salamander baseline monitoring will continue in the Bull Creek watershed.

- Additional EC training and education will be implemented as additional staff, consultants, and contractors become engaged in the project.

Engineering

Recent Activities

- Site work for Geotechnical Investigations have been completed on the Bull Creek Site
- Site work for Geotechnical Investigations have been completed on the Raw Water Line from the Intake to the Bull Creek Site
- CEF feature locations have been surveyed and tied to the WTP 4 site coordinate system.
- WTP layouts are being revised at the Bull Creek site.
- Conducted three process equipment "lessons learned" session on the design of the current Ullrich WTP project.

Upcoming Activities

- Geotechnical drilling will begin in Lake Travis, in early April.
- Site Plan Work shop with facilitator scheduled April 17, 2007.
- Preliminary engineering work continuing
- Draft evaluations of chlorine storage and feed options are being reviewed
- Draft evaluation of options for handling Lime Residuals are being reviewed
- Continue to work with Site Development Plan Reviewers on proposed plans to begin construction of the Storm water facilities in October 2007.
- Preliminary concepts are being developed for the administration building, and potential LEED credits

Communications

Recent Activities

- A newsletter on the WTP 4 Project is being prepared for issuance in April.
- New information was posted to the WTP 4 website at <http://www.ci.austin.tx.us/water/wtpfour.htm>.
- A meeting was held with the Overlook@ Bull Creek Homeowners Association and the Upper Bull Creek Neighborhood Association to discuss the status of the project.
- The information email and the information telephone line are logging and calls and responses are being added to the Listening Log.

Upcoming Activities

- Monthly status reports will be prepared and distributed to the Environmental Board and others.
- 1st of two Community Wide Open House Meeting for this year has been scheduled for mid April. Invitations will be sent out to the public.



MEMORANDUM

TO: David Anderson, P.E., Environmental Board Chair and Members

FROM: Chuck Lesniak, REM, Environmental Program Coordinator
Watershed Protection and Development Review Department

DATE: April 12, 2007

SUBJECT: Response to Questions on WTP4 Status Report

Attached are responses to your questions on the Water Treatment Plant #4 February Status Report. If there are any questions, please contact me at 974-2699 or by e-mail to charles.lesniak@ci.austin.tx.us.

Chuck Lesniak, REM
Environmental Program Coordinator
Watershed Protection and Development Review Department

Response to Environmental Board Questions Submitted March 27, 2007

Page 1

1. What is "significant loss" in the first issue resolution?
"Significant" was not defined other than as an unusual loss of drilling fluid. As it turned out, all of the borings lost most or all of the drilling fluid during the borings. As a result of the Environmental Commissioning (EC) process, the drillers used only water from Bull Creek as a boring fluid, no bentonite or other additives were used.
2. Need a map of the Bull Creek crossings listed in the 2nd issue resolution.
Attached
3. Need a copy of the tailgate briefing agenda listed in the 3rd issue resolution.
Attached

Page 2

1. Under EC recent activities, what are results of the geotech boring activities?
We have not received the boring logs as of yet, but expect to shortly. We should be able to include a discussion of this at the April briefing.
2. Under EC upcoming activities, when will we have results of groundwater dye tracing?
Early results are in and we can include this in the April briefing as well.
3. Under EC upcoming activities, can we get a copy of EC checklists?
Attached
4. Under EC upcoming activities, what are type and location of stormwater monitoring equip?
There are currently 2 stormwater monitoring sites on Bull Creek located upstream and downstream of the property (see attached map). We have not been able to install monitoring stations on Tributary 8 because there are no suitable, accessible monitoring locations.

Each station consists of an equipment shelter housing two flow meter/data loggers, two automatic water samplers, and two cell phones for remote control and data communications. The equipment is battery powered with a solar panel installed near each station. A rain gauge has also been installed at each station. These stations should be able to characterize the stormwater impacts of the plant on Bull Creek.

5. Under EC upcoming activities, please describe training and education in last bullet.
All contractors and City staff that work on the project will receive training describing the environmental sensitivities of the site and an overview of the Commissioning process. All field workers (geotech staff, surveyors, etc.) receive environmental protection "tail gate" briefings.
6. Under Engineering recent activities, what do revised WTP layouts look like? Bigger?
The WTP 4 site plan is being developed based upon the BMPs in the Mitigation Plan. A workshop has been scheduled in mid-April with a conservation design firm that will assist in laying out the water plant within the technical, engineering, and environmental constraints of the site.

Page 3

1. Under Engineering recent activities, what are the results of the lessons learned session on Ullrich?

2

Three lessons learned sessions on plant process equipment have been conducted with the Ullrich WTP plant personnel and AWU staff involved in the Ullrich WTP design. Minutes of the meeting will be used to improve the design of the process equipment used on WTP 4.

2. Under Engineering upcoming activities, when will CEF features be surveyed?
The survey work to tie the locations of the CEF features to the Plant baseline survey has been completed.
3. Under Communication recent activities, what were the results of the meeting with the Bull Creek Foundation? What were there concerns?
At the time of our meeting with the Bull Creek Foundation we were still trying to persuade the County that the Cortaña Site was where WTP 4 should be built. We advised them that unless the County agreed to proceed with the Cortaña site, the City was committed to designing constructing WTP 4 on the Bull Creek Site. We then discussed in great detail the Environmental Commissioning process and addressed their questions. They seem pleased that as part of the mitigation process there will be an Environmental Inspector assigned to the plant site and the upper Bull Creek watershed.
4. Under Communication upcoming activities, what is the frequency and schedule of informational meetings and community-wide to be held?
We have committed to two open house meetings during 2007. The first is an open house scheduled for April 23, 5:30-7:30 at 3M and the second meeting will be held in the fall.

General

1. How has delay in awarding the Environmental Commissioning project to a 3rd party impacted ongoing or already completed activities (both design and construction)?
WPDRD staff are serving in the role of EC agent until the consultant can be hired. We believe this has been effective, but we realize there are some limitations on depth of analysis and participation with this arrangement. One of the first tasks for the EC consultant will be to review the EC work that has occurred prior to their being hired. Additionally, a firm from the Public Works environmental services rotation list is being hired to develop contaminant impact threshold concentrations and to perform any needed environmental impact analysis until the permanent firm is hired.
2. When will the Board be briefed on the results of conversation with Seattle on their treatment plant?
Staff is still trying to schedule that discussion and the results will be included in the monthly status report and the subsequent quarterly briefing once it has occurred.

Water Treatment Plant #4
Environmental Briefing for Light Field Activities

The Water Treatment Plant #4 site is located in a very sensitive natural environment. It contains habitat for federally regulated endangered species (birds) and very rare aquatic species (salamanders). Extreme care must be taken to prevent any amount of pollution at the site. Requirements include:

- Any leaking equipment must be shut down and the leak stopped or the equipment must be removed from the property.
- Fueling, oil changes, chain oiling and similar activities must occur in a contained area (pickup bed, lined area) or the activity must occur off the property.
- Any spilled or leaked oil, fuel, hydraulic fluid or other materials must be cleaned up immediately. Spills must immediately be reported to the City at 974-2550.
- Any wounds from damage or cutting of oak trees must be sealed with an appropriate wound sealing material within 30 minutes. Other common oak wilt prevention practices must be followed as well.
- No protected size tree (>8" diameter) may be cut without a City of Austin permit.
- A supervisor that has received this briefing must be on site at all times.
- No soil disturbance may occur within 300' of known Critical Environmental Features with City of Austin approval.
- Portable toilets must be provided for workers at the site.
- Any trash brought in must be removed from the site at the end of each work day.

Acknowledgement

I have received and understood the briefing as described above.

Print Name

Signature

Company

Date



Draft Technical Memorandum

To: Mitigation Working Group - City of Austin
From: Paul Walker - Carollo Engineers
Date: April 10, 2007
WO #: 6460G.00
Subject: Environmental Commissioning Checklist Guidance Document
Prepared By: Paul Walker, P.E.

1.1 OVERVIEW

The Environmental Commissioning (EC) Process is intended to be a collaborative effort between the Design Team and the EC Agent and staff working in a "proactive participation" mode to achieve the following goals for the project:

- A WTP that achieves operational requirements and is completed on-time and on-budget
- Protection of environmental resources in the vicinity of the WTP

The EC Checklist will serve to guide both the Design Team and the EC Agent's team through the preliminary design, design, construction, start-up, and operations of Water Treatment Plant No. 4 (WTP 4). The EC Checklist will be used to help implement the goals and recommendations set forth for the project in the report titled "Water Treatment Plant 4 Environmental Goals & Recommendations for Mitigation, Best Management Principals, Monitoring, and Environmental Commissioning" (October 2005). Through the EC Checklist process, the following guiding principals should also be considered in the overall design of the facilities to help achieve the environmental goals established for the project.

1. Thoughtfully consider effects; don't assume no effects
2. Consider sustainable alternatives
3. Avoid or minimize site excavation when practical. In general, fill is preferable to cut.
4. Minimize chemical usage during construction and operations
5. Minimize impervious surfaces
6. Promote natural infiltration where feasible and appropriate
7. Preserve or mimic groundwater and surface water hydrologic regimes
8. Look for resource re-use or conservation opportunities



9. Strive for energy efficiency
10. Consider non-standard or accidental operations, assume that “what can go wrong, will”
11. Where feasible, minimize or eliminate the emission of noise, dust, light, chemicals, sediment, liquids, solids, gases, etc. from the site

The EC Checklist should address the following:

- **Project Components:** The project will be divided into components on a facility-by-facility basis. Each facility will be examined individually to estimate potential effects on the environment and to develop methods for mitigating effects. Effects should be considered for the construction phase and operation phase of the project. A separate checklist will be prepared for each facility. In addition, another checklist will be prepared for the entire site to evaluate the cumulative effects of all the facilities and to identify potential effects and mitigation measures not attributable to the individual facilities.
- **Documentation:** Documenting the information along with assumptions and decisions made will be critical for the success of the EC Process. The EC Checklist will serve as an outline and table of contents for folders that will be prepared for each facility. Each folder will include information on layouts, design criteria, assumptions, materials to be used during construction and operations, possible spill/release mechanisms, the effects of possible releases of those materials, documentation as to the effects on the surrounding environment, decisions, environmental controls, and other documentation as necessary to fully describe the process used to develop the recommended facilities.
- **Collaboration:** The EC Checklist formalizes the interaction between the Design Team and the EC Agent by implementing a series of milestones, or checkpoints, where the two groups meet and develop approaches for achieving the project goals. Breaking the process down into a formal checklist allows for a systematic approach for addressing both environmental and WTP facility issues and requirements. The process also allows the work to progress in a logical sequence whereby decisions are made when needed so that the next phase of work can begin without the need to revisit previous decisions and actions taken.

1.2 CHECKLIST INSTRUCTIONS

- 1) **Updating:** The Design Team Facility Lead is responsible for keeping the EC Checklist and associated documentation current until it is completed by the Design Team. Once the Design Team is done with the EC Checklist, then the EC Agent will be responsible for the approval and monitoring of the checklist. The documents will be reviewed on a regular basis by the Design Team Project Managers and the EC Agent.
- 2) Each Checklist shall be reviewed regularly with the EC Agent for completeness and content, and a completed checklist shall be issued for review by the EC Agent. Comments received from the EC Agent on the completed checklist shall be addressed as applicable and a final checklist issued. If the Design Team Facility Lead and the EC Agent cannot agree on the checklist modifications, then the issue resolution process will be implemented.
- 3) **Documentation:** Each checklist should be accompanied by notes that document discussions and decisions made relative to the EC process. An EC folder will be created and maintained for each facility. The folder will serve to document the process used to design and commission each facility and the decisions made relative to that facility. A hard copy of each folder will be maintained by the EC Agent, and a virtual folder will be maintained on ProjectWise®. The EC



Checklist will serve as the table of contents for each folder, which will be subdivided into sections corresponding to each task in the EC Process (i.e., task P1 through P23 for the Preliminary Design Phase). Items to be included within each section include meeting minutes, agendas, documentation of correspondence, decision logs, and submittal information.

- 4) Specific Instructions: The following instructions are specific to the individual tasks in the checklist process:
 - a) P1: Before beginning design related tasks for a facility, the Design Team Lead shall review the goals and requirements from the report titled "Environmental Goals & Recommendations for Mitigation, Best Management Practices, Monitoring, and Environmental Commissioning" (October 2005) with the Project Team. The goals and requirements shall be summarized and developed into design criteria as applicable.
 - b) P2: Prepare a general description of the facility including design criteria, functions, layouts, phasing requirements, etc. The description must include a general description of the facility and its functions directed towards an audience of professionals not directly involved with the project. The process of developing the facility description includes review and acceptance by the Water Utility Core Team, Project Managers, Design Team Quality Management personnel, and Subconsultants.
 - c) P3: Summarize materials of construction and environmental information (a-f) for use in developing recommendations for environmental controls. Include materials that have potential to emit or discharge noise, dust, light, volatile chemicals, spills, sediment, liquids, solids, gases, etc.
 - d) P4: Design codes to be followed during the detailed design criteria shall be summarized here (Note: detailed code requirements will be developed during the final design phase). These may include the following:
 - i) City of Austin Land Development Codes
 - ii) TCEQ Edwards Rules, TPDES, and any other TCEQ design criteria
 - iii) International Building, Mechanical, and Plumbing Codes
 - iv) National Electric Code
 - v) EPA
 - vi) Others as applicable
 - e) P5: Review the Permit Technical Memorandum to determine specific permitting requirements that apply to this facility. Summarize permit requirements.
 - f) P6: Identify potential exceptions to environmental regulations (local, state, federal) that could be necessary for construction of the facility. For example, will the City's cut and fill limitation of eight feet need to be exceeded?
 - g) P7: Review the LEED checklist with the Design Team architect and Project Managers to determine what, if any, requirements apply to this facility. Summarize LEED components that are intended to be implemented for the facility. (NOTE: LEED design is not directly part of the EC Process, but decisions made relative to LEED design can have a potential influence on the EC Process.)
 - h) P8: Develop an initial listing of the potential effects that construction of this facility, considering both normal and accidental or non-standard operations (e.g., spills and unauthorized releases), could have on the surrounding environment. Review the "Guiding Principals" (above) and the Mitigation Plan for applicability to this facility.



- i) P9: Similar to P8, Develop an initial listing of the potential effects that the operation of this facility, considering both normal and accidental or non-standard operations (e.g., spills and unauthorized releases) could have on the surrounding environment. Review the "Guiding Principals" (above) and the Mitigation Plan for applicability to this facility.
- j) P10: Identify situations or specific elements of the facility where operational efficiencies could potentially be implemented. Examples include specifying higher efficiency pumps or motors for certain applications, considering two levels of lighting in certain areas to minimize energy used for lighting, and using common wall construction where feasible.
- k) P11: Upon completion of Tasks P1 through P10, the information generated will be submitted to Design Team Quality Management (QM) lead and Project Managers for review. Upon acceptance, the documentation shall be forwarded as a draft work in progress to the EC agent for review.
- l) P12: Schedule and conduct a workshop with the EC Agent and associated EC personnel to review the preliminary design information, discuss ideas, refine environmental goals as needed, discuss issues, and identify Best Management Practices (BMPs) and environmental controls.
- m) P13: Minutes shall be prepared for the workshop conducted under P12: The minutes will serve to document decisions made and any modifications that could be implemented for the facility design. The minutes will be issued in draft form for review and acceptance by the EC Agent. The Issue Resolution Process shall be implemented at this point in the process when the Design Team and the EC Agent/staff cannot achieve resolution on certain issues.
- n) P14: Document and develop any refinements, modifications, or new environmental goals identified through Tasks P12 and P13.
- o) P15: Document and develop any refinements, modifications, or new BMPs identified through Tasks P12 and P13.
- p) P16: Document and develop any refinements, modifications, or new adaptive management techniques identified through Tasks P12 and P13.
- q) P17: Update the information (drawings, design criteria, etc) developed under tasks P2 through P10 based on decisions made and accepted through P12 and P13 and the requirements specified in Tasks P14 through P16. The information generated will be submitted to Design Team Quality Management (QM) lead and Project Managers for review. Upon acceptance, the documentation shall be forwarded as a draft work in progress to the EC agent for review. (Note: In some instances, this information may be included as part of the draft Technical Memorandum (TM) issued for the facility under step P22 below. This should be confirmed with the EC Agent).
- r) P18: Schedule and conduct a workshop with the EC Agent and associated EC personnel to review the revised design information, discuss ideas, finalize environmental goals, Best Management Practices (BMPs), and environmental controls. During this workshop, review the minutes from P12 to determine whether all previously identified issues have been addressed. Note: In some instances, this workshop may be held in conjunction with the workshop for the draft TM review under step P23 below. This should be confirmed with the EC Agent).
- s) P19: Minutes shall be prepared for the workshop conducted under P18: The minutes will serve to document decisions made and any modifications that could be implemented for the facility design. The minutes will be issued in draft form for review and acceptance by the EC Agent. The Issue Resolution Process shall be implemented at this point in the



- process when the Design Team and the EC Agent/staff cannot achieve resolution on certain issues.
- t) P20: Prepare draft Technical Memorandum (TM) for facility. TM to be reviewed by Design Team QM Lead and Project Managers.
 - u) P21: TM to be issued as part of Preliminary Design draft report.
 - v) P22: Conduct final workshop with EC Agent/staff, City personnel, peer review team, and subconsultants to review preliminary design, discuss any outstanding issues, and collect comments for finalizing the report.
 - w) P23: As applicable, update the TM based on comments received at final workshop and issue as part of final report.

1.3 ISSUE RESOLUTION

One of the intents of the EC Checklist process is to resolve issues at the working level of the Design Team and the EC Agent's Team. When an issue cannot be resolved at the working level, a representative of either the EC Agent or the Design Team can request that it be elevated to the level of the EC Team. The EC Team is comprised of representatives from the Design Team, the Austin Water Utility, Watershed Protection and Development Review, and the EC Agent. If the EC Team cannot resolve the issue, then it can be escalated to the level of City Management for a final decision.

A goal for the EC process is to resolve issues at the working level and only escalate issues that have the potential to significantly affect cost, schedule, or the ability to achieve the goals established for the project. A rule of thumb is that at least 80 percent of issues are resolved at the working level, up to 15 percent are resolved at the EC Team level, and less than 5 percent require escalation to the level of City Management.



Environmental Commissioning Checklist

Facility ID: _____

Design Team
Facility Lead: _____

Refer to the Environmental Checklist Process Guidance Manual on the use and application of this Checklist. The Design Team Facility Lead is responsible for completing the tasks in the following checklist, initialing the checklist when a task is completed, and reviewing the checklist with the Environmental Commissioning (EC) agent at least monthly. The EC Agent is responsible for reviewing the checklist with the Design Team Facility Lead, participating in key activities where required, and initialing when an EC-related task is complete. The current version of this document, complete with attachments, shall be posted to ProjectWise®, and the original copy with attachments shall be stored in the project files in the Design Center. Where requirements do not apply to this facility, enter "NA."

PRELIMINARY DESIGN PHASE	Design Lead	EC Agent
P1. Review overall goals, BMPs, Monitoring, and Environmental Commissioning (EC) for facility (October 2005 report) w/ Project Team		
P2. Prepare general facility description (~ dimensions, preliminary criteria, size, function, components, phasing, etc)		
P3. Summarize Materials of Construction		
a. determine the products that may affect the environment that could be used for facility		
b. estimate the quantity to be onsite		
c. review and catalog MSDS sheets for products		
d. list toxic ingredients and potential discharge concentrations		
e. effects on local species or type		
f. reference for specific effects		
P4. List applicable design code(s)		
P5. Determine permit requirements that apply to facility		
P6. Identify potential exceptions		
P7. Determine if LEED applies to facility, summarize how it applies (review with Architect, see LEED checklist)		



P8. Review Guiding Principals and Mitigation Plan. Summarize potential effects during construction of facility to the following:		
Stream Water Quality and Quantity		
Stream Hydrology		
Groundwater Quality and Quantity		
Groundwater Hydrology		
Underground features (caves, voids, fissures)		
Air Quality		
Noise		
Light		
Flora		
Birds, cave invertebrates, salamanders, aquatic invertebrates, etc.		
P9. Review Guiding Principles and summarize potential effects from operation of facility to the following:		
Stream Water Quality and Quantity		
Stream Hydrology		
Groundwater Quality and Quantity		
Groundwater Hydrology		
Underground features (caves, voids, fissures)		
Air Quality		
Noise		
Light		
Flora		
Birds, cave invertebrates, salamanders, aquatic invertebrates, etc.		
P10. Identify opportunities for operational efficiencies		
P11. Submit items P2-P10 to EC Agent for review		
P12. Meet with EC Agent to review comments, develop goals, discuss issues, identify BMPs and controls		
P13: Prepare and issue minutes and decision log from Workshop		
P14. Summarize specific environmental goals for facility		



P15. Summarize BMPs and controls for facility		
P16. Identify adaptive management opportunities for facility		
P17. Update items P2-P10 per meeting and tasks P14 through P16 and submit to EC Agent for review		
P18. Meet with EC Agent to review and finalize goals, BMPs, controls		
P19: Prepare and issue minutes and decision log from Workshop		
P20. Prepare draft Technical Memorandum (TM) for facility		
P21. Issue draft TM as part of draft Preliminary Design Report		
P22. Conduct workshop w/ City, Design Team, & EC Agent to review draft report		
P23. Finalize and issue TM as part of Pre-Design Report		

Note: shaded cells require no action.

File
Hand out
5/2/07
MC

**WTP4 Environmental
Commissioning**

**Environmental Board
Quarterly Briefing
May 2, 2007**

**Environmental
Commissioning**

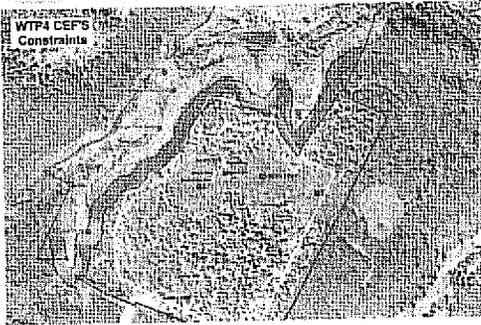
"A dedicated team responsible for constantly auditing the environmental performance goals of the project from planning, design, construction and through operation."

C-1

Environmental Commissioning

- Consultant status
- Budget and scope changes
- Status of groundwater, surface water, and stormwater monitoring
- BCP issues
- Other EC highlights
- Challenges
- Upcoming activities

Environmental Commissioning



EC Consultant

- RFQ pulled in February to resolve conflict of interest questions and refine scope
- Conflict changes:
 - Prime
 - Non-WTP4 contracts with AWU now allowed
 - No longer allow prime to contract with Carolis
 - No work ever on WTP4 changed to no work since '02
 - Sub
 - No work ever on WTP4 changed to no work since '02
 - Other
 - Firms employing Board/Commission members barred from submitting.

EC Consultant

- Scope changes:
- Shorter design period
 - Increased science support
 - Work during const. phase changed from full-time to on-call
 - Remove sustainability and LEED tasks
 - Add environmental impact analysis for plant emissions that exceed defined threshold

EC Consultant

Current status:

- RFQ re-issued March 23
- 4 SOQ's received April 23
- Recommendation to Council June 7
- Expect contract complete early July

EC Budget

Activity	Original Estimate	Revised Estimate	Cost Differential
Env. Commissioning			
EC Consultant	\$6,760,000	\$3,393,386	-\$3,366,614
EC Project Mgmt.	\$1,010,549	\$801,799	-\$208,750
Commissioning Total	\$6,780,549	\$4,195,185	-\$2,585,364
Monitoring Total	\$3,424,328	\$2,137,000	-\$1,287,328
Other Mitigation			
Construction Discharge Remediation Contract	\$160,000	\$0	-\$160,000
Env. Inspection	\$1,061,391	\$614,219	-\$447,172
HMP Study	\$350,000	\$350,000	\$0
AWU Preserve Staff	\$199,937	\$199,937	\$0
Other Mitigation Total	\$1,771,328	\$1,064,156	-\$707,172
Revision Total	\$11,964,203	\$7,398,314	-\$4,565,889

2014



Stormwater Monitoring

- Installation completed in March
- Sites fully operational
- No storms collected to date



Salamander Monitoring

- Began mark and recapture in February
 - 700 salamanders marked
- Surface counts ongoing
 - 132 salamanders found at 2 sites in most recent count
- Surface counts and mark/recapture 2 weeks per month

Salamander Monitoring



Surface Water Monitoring

- Monitoring every other month
- Developing baseline data
- Learning about stream criteria and improving monitoring methods
- Background monitoring ends in August

Groundwater Monitoring

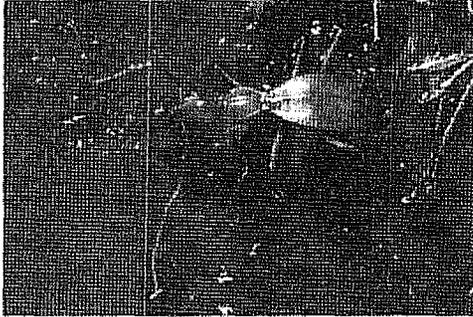
- First dye tracing complete with very limited success
- Second round of tracing planned using larger volumes of water and dye
- WPDRD staff mapping geology of site

BOP

Endangered Tooth Cave ground beetle

- Found in CEF on 3/29
- CEF already has 300' buffer
- Species mitigated by current FWS permit, but project will treat location as if not mitigated
- Discussions with FWS pending
- Other CEF's being baited

BCP



Other EC Highlights

Site Plan Design Workshop

April 17, 2007

- Design consultants, AWU and WPDRD staff
- Led by Randall Arendt, recognized conservation design expert
- Consensus reached on conceptual layout and options to minimize site disturbance during construction
- Additional financial and environmental impact analysis needed on depth of excavation

Other EC Highlights

Permanent Stormwater Pond Design

- Collaborative process with WPDRD Water Quality Eng. and Site Plan Review staff
- SOS non-degradation standard and capture volume
- Concept is hybrid sedimentation/filtration with retention/irrigation
- Permit in June, construction start in October 2007

Current EC Challenges

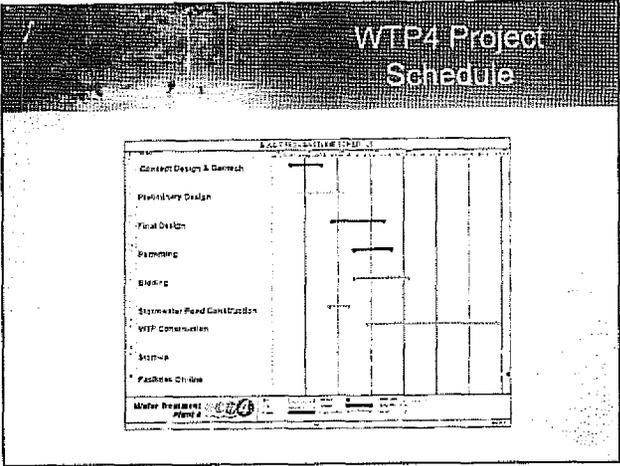
- EC consultant selection
- Depth of excavation
- Substation sizing
- Maintaining/enhancing groundwater recharge
- Construction staging
- Pump station location

EC Upcoming Activities

- More groundwater dye tracing
- Continue salamander, surface water and stormwater monitoring
- Work with FWS on beetle habitat needs
- Work on stormwater pond design, disinfection options, lime residuals, up flow clarifiers and other design elements with design staff

WTP4 Project Highlights

- Geotechnical investigations completed on Bull Creek site and along Raw Water Pipeline Route
- Geotechnical drilling on Lake Travis at intake site are underway
- CEF features on Bull Creek Site tied to property survey



WTP4 Project Communications

Two newsletters distributed to over 19,000 citizens

Heads for Neighbors

Participate in the next... [text]

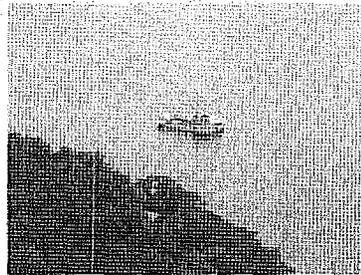
Heads for Neighbors

Water Treatment Plant 4

WTP4 Project Communications

- First of two Open House meetings held on April 23, 2007
- Over 70 citizens attended

Raw Water Intake



L. Travis drilling platform with protective booms



1.6.2 General Design Guidelines

The following section discusses general design parameters which most BMP water quality controls have in common. These parameters include the volume of run-off which is to be treated, a method to isolate this volume, and liner requirements.

A. **Water Quality Volume.** The primary control strategy for water quality basins is to capture and isolate at least a minimum volume of storm water runoff for treatment. The minimum volume is the first one-half (0.5) inch of runoff plus an additional one-tenth (0.1) inch for each ten (10) percent increase of gross impervious cover over twenty (20) percent within the drainage area to the control. This depth of runoff from the contributing drainage area to the control is and will be referred to as the "Water Quality Volume." The water quality volume must consist of runoff from all impervious surfaces such as roadways, parking areas and roof tops, and all developed pervious areas. Water quality treatment is not required for runoff from lands left in their natural state, e.g., greenbelts and open spaces. Runoff from these areas must be routed around the water quality basin or it must be included in the water quality volume. Off-site contributing drainage should be routed around the water quality basin. If this is not done, off-site contributing areas must be included in the water quality volume or a hydrologic study must be presented which indicates insignificant mixing with the on-site water quality volume. A separate case from the above is a commercial subdivision. Since development on individual lots in commercial subdivisions will incorporate water quality controls, the water quality volume for roadways in commercial subdivisions may be based on only the likely contributing drainage area of the roadway after the lots are developed. That is, contributing drainage to roadways from the individual lots does not have to be included in the water quality volume for a commercial subdivision provided that the total drainage area contributing to the roadway pond does not exceed fifty (50) acres. Section 1.6.10 includes example calculations for determining water quality volumes.

Because travel time from distant contributing areas reduces the effectiveness of the water quality controls in capturing all of the water quality volume, a maximum contributing drainage area of fifty (50) acres per water quality control basin is recommended.

B. **Water Quality Volume Diversion Structures.** Off-line water quality controls are required to have a diversion structure or splitter box which will capture and isolate the water quality volume. A typical approach for achieving isolation of the water quality volume is to construct an isolation/diversion weir in the storm water channel such that the height of the weir equals the elevation of the water quality volume in the pond. When runoff in excess of the water quality volume enters the storm water channel it will spill over the isolation/diversion weir with minimal mixing with the already isolated water quality volume. The splitter design must be capable of passing the peak flow rate of a twenty-five (25) year storm into the water quality pond, and pass the peak flow rate of the one-hundred (100) year design storm past the basin without overtopping the pond walls.

Figures 1-48 through 1-50 in Appendix V of this manual present examples of these structures.

AGENDA ITEM C-1

C. **Basin Liners.** All wet ponds require an impermeable liner. Impermeable liners are also required for water quality basins located over the Edwards Aquifer Recharge Zone and in areas where there is surface runoff to groundwater conductivity. Impermeable liners may be clay, concrete, geosynthetic clay liner (GCL), geomembrane, or other approved liner, depending on the application. The analysis and design should entail a comprehensive review of the site specific conditions to determine the most appropriate type of liner for the site, and should include a stability analysis of the pond side slope. The guidelines below must be used for the design of liners for wet ponds, sedimentation basins, filtration basins, and retention ponds as applicable. The criteria in item 1 is applicable to any size basin or pond, while the criteria in item 2 may be applied to sedimentation basins, filtration basins and retention ponds that are less than 1,000 square feet in area. When required for sedimentation/filtration basins, the liner must underlie both the sedimentation basin and filtration basin and any gabion wall areas.

1. Wet Ponds, Sedimentation Basins, Filtration basins, and Retention Ponds

There are a number of important engineering design and construction considerations for wet pond liners and other basin liners. A geotechnical engineer must be involved in all aspects of the liner design. All liner studies, plans, details, specifications and other related documents must be sealed by a geotechnical engineer. Careful attention must be paid to each of the following areas:

- **Liner subgrade** – A stable subgrade is very important in the construction of the pond or basin. Careful evaluation must be conducted to ensure the liner will be placed on a suitable base. If any voids are encountered, proper geotechnical analysis must be performed to ensure that the integrity of the liner can be maintained. Proof rolling must be conducted as necessary to determine the suitability of the subgrade, and any suspect areas must be reworked and recompact, or the weak soils removed and replaced with suitable fill material. Native clays must be screened to remove particles exceeding 0.25 inch diameter. The subgrade for geomembrane or GCL must be smooth and contain no particles greater than 0.375 inch diameter.
- **Liner characteristics** – At least ~~two~~ three types of liners can be considered, including a clay liner of appropriate thickness and permeability, ~~and a geomembrane liner, and GCL.~~ Alternative liner designs may also be considered.
 - If **geomembrane** is used, it must have a minimum thickness of thirty (30) mils and be ultraviolet resistant. Use of a geomembrane also requires that a suitable geotextile fabric ~~must~~ be placed on the top and bottom of the membrane for puncture protection if any particles greater than 0.375 inch are present in the cover soil or subgrade surface, respectively. The geotextile material must have a minimum unit weight of 8 oz./Ssq. ~~Yd., and a minimum filtration rate of 0.08 in./sec.~~ The fabric must have a minimum puncture strength of 125 lbs., a minimum Mullen Burst Strength of 400 psi, and a minimum tensile strength of 200 lbs. ~~The equivalent opening size must be No. 80 minimum.~~ The designer must demonstrate the liner's impermeability, and the method of liner protection to be used during maintenance and sediment removal operations. Equivalent methods for protection of the geomembrane liner will be considered by the Watershed Protection and Development Review Department on a case by case basis. Equivalency will be judged on the basis of ability to protect the geomembrane from puncture, tearing and abrasion. Figure 1-56 in Appendix V of this manual illustrates this placement. Individuals installing geomembrane liners must be trained and/or certified by the liner manufacturer. Figure 1-56B and 1-56C in Appendix V of this manual present

examples of geomembrane liner end details for use on concrete walls, stacked stone walls, and earthen embankments.

- If a **clay** liner is used, it must be designed for the site-specific conditions by a geotechnical engineer, and must have a minimum thickness of twelve (12) inches or greater. Coefficient of permeability must be 1×10^{-6} to 1×10^{-7} cm/sec or less. Other parameters must be as follows: Plasticity index of not less than 20 and not more than 30; Liquid limit of not less than 30; and must have at least 30% clay particles passing the No. 200 sieve, with a maximum particle size of 0.25 to 1 inch. Soil must be processed to reduce clod size as much as possible prior to compaction and compaction of the lifts must be done using footed rollers. Clay compaction must be no less than 95% of Standard Proctor Density at or above optimum moisture content or 90% of Modified Proctor Density at a moisture content between 1% dry and 3% wet of optimum. Soil sampling and testing must be conducted on both the borrow source samples as well as the installed liner. Liner material verification sampling and testing should occur a minimum of four times during liner construction (initial, 25% complete; 50% complete and 75% complete). In-situ materials may be used if it can be demonstrated that all required liner parameters will be met. If the clay liner is to be overlain by a drainage layer, a suitable geotextile fabric must be placed on the surface of the liner prior to placement of the drainage layer to prevent plugging of the drain by the clay liner. If a clay liner is used, suitable geotextile fabric shall be placed on top for puncture protection. Figure 1-56A in Appendix V of this manual illustrates this placement.
- Geomembrane or GCL Liner placement over excavated rock requires installation of protective material to prevent damage to a geomembrane or clay liner. Examples of protective material include spray-on fiberglass, additional clay liner material, or placement of a geosynthetic fabric.
- An **alternative liner design** may be approved by the Director of the Watershed Protection and Development Review Department if it can be demonstrated by the responsible party that the liner is at least equivalent to or exceeds the above requirements.
- **Handling of liner penetrations** - Locations of liner penetrations are one of the areas of the pond or basin that are most susceptible to leakage and should be avoided or minimized wherever possible. It is critical that the design and construction of these areas pay special attention to liner continuity around these interface points. Detailed analysis must be performed related to the handling of all areas of liner penetrations such as pipe inlet and outlet structures, headwalls, and areas where concrete access ramps, maintenance and pump pads interface with the liner. Consideration must be given to the need for special applications such as anti seep collars, gaskets, clay or bentonite plugs, special backfill and compaction, and other measures to prevent leakage around all these areas. Intake pipes should be doubled-walled or lined below the elevation of the water quality volume or permanent pool elevation.
- **Protecting the liner from erosion** - The integrity of the liner, particularly a clay liner, can be severely compromised by any erosion that may occur at the surface of the liner. The design must provide appropriate mechanisms to prevent erosion of the liner at all areas, including the inlet structure and the separation berm between the forebay and main pool of wet ponds. Additionally, the liner must be continuous under wet pond separation berms to minimize the potential for leakage at the equalization/interbasin pipe.

- **Protecting the liner against damage and loss of moisture** – It is imperative that the clay liner be kept moist during construction and prior to the time the basin is filled. Otherwise, cracks can develop in the clay, particularly during the hotter months of the year, thereby rendering it susceptible to leakage. For wet ponds, provisions must be included in the construction documents that require the contractor to protect the liner against loss of moisture until the basin is completely filled. For all ponds, damage to unprotected clay, GCL, or geomembrane liners can also occur due to passage of equipment during construction or during future sediment removal and maintenance operations. To minimize the possibility of damage and drying, all liner designs should include a protective soil layer over the liner with a minimum thickness of 12 inches for clay liners, and 24 inches for GCL and geomembrane (the 24-inch thickness can be reduced for liners which are never to undergo traffic by heavy equipment or are otherwise protected from heavy equipment). The protective cover layer includes 4-inches of topsoil per City of Austin Landscape criteria.
- **Liner Plans and Specifications** – The engineer must prepare the necessary plans and specifications to provide the contractor clear direction for the construction of the liner and all related components. Construction details must be included for all liner cross-sections, penetrations, and any other areas requiring special attention and/or guidance to ensure proper construction. A scale drawing of the area to be lined, including a grid established across the base and side slopes of the pond or basin with target elevations shown, must also be prepared by the engineer. This grid will provide a basis for verification of liner thickness during construction and will be used for the purpose of recording elevation data prior to placement of the initial lift and following placement of the final lift. All required testing, standards, procedures, and material properties must be spelled out in detail in the documents. Parties who are responsible for any surveying, sampling, testing and other verification requirements must be identified in the documents.
- **Groundwater Control** – Liners constructed below groundwater will require dewatering as necessary to allow construction of the liner. To prevent damage to the liner due to uplift pressures after termination of dewatering or during future maintenance, the liner must include placement of sufficient soil ballast or additional thickness of clay liner to resist any uplift pressures.
- **Construction Quality Assurance/Quality Control Plan** – A construction Quality Assurance/Quality Control (QA/QC) Plan must be prepared by the engineer for the purpose of providing a basis for all construction/installation and testing of the liner system during the liner construction process. The QA/QC plan must be approved by the City prior to liner construction.
 - For clay liners, the QA/QC plan must include, but not be limited to, the following items: **recordkeeping documents**, including daily construction reports, inspection and test data sheets, non-conformance and corrective measure reports, design and specification changes, and all other documentation accumulated by inspection personnel during construction; **pre-construction soil sampling, testing and documentation protocol**, including the type of information to be documented for each sample, and the test procedures to be used; **protocol during construction**, including the monitoring of the subgrade, as well as material placement (including items such as density testing and moisture content, lift thickness and bonding, processing of soil and reduction of clods, footed compaction equipment, and number of passes of compaction equipment), sampling and testing procedures, frequencies and other requirements; Also, the handling

of any liner perforations as a result of various types of testing must be addressed along with guidance on how to address any deficiencies that may be discovered, including corrective measures to be taken.

o For geomembrane and GCL liners, the QA/QC plan must include, but not be limited to, the following items: **geomembrane/GCL manufacturing and delivery data requirements**, including raw materials properties, ~~geomembrane~~ roll and production quality assurance and control data requirements, along with transportation, handling and storage requirements, and conformance testing; **installer qualifications requirements**; **membrane installation requirements**, including surface preparation, system anchorage, geomembrane/GCL placement (including, but not limited to panel identification, placement and installation schedule), seaming information (including, as applicable to geomembrane or GCL, ~~but not limited to~~ seam layout, preparation, equipment, weather conditions, trial welds, general procedures, non-destructive testing and destructive testing), identification of defects and repair procedures, and geomembrane/GCL acceptance procedures.

- **Soils and Liner Evaluation Report (SLER), Geosynthetic Clay Liner Evaluation Report (GCLER), or Flexible Membrane Geomembrane Liner Evaluation Report (FMGLER)** – All liner construction and QA/QC activities must be under the supervision of an independent licensed engineer with experience in geotechnical engineering. The engineer or his representative must be on site for all liner construction and testing. Following completion of the liner construction, an SLER, GCLER, or FMGLER (as applicable for the type of liner installed) must be prepared under the direction of and sealed by the engineer and submitted to the City. The report is intended to provide documentation of all installation methods and testing procedures conducted during the installation of the liner and to provide evidence that the liner was constructed in accordance with the construction plans, technical specifications and QA/QC plan.
- **Water Level Monitoring for liner integrity verification in wet ponds** – After the filling and installation of aquatic vegetation in a wet pond, the water level of the permanent pool shall be measured monitored for a minimum of eight weeks. The engineer shall specify the method and frequency of monitoring, and the responsible party for conducting water level monitoring. The engineer shall perform a water balance, as specified in 1.6.6.C. 5, to determine that the water loss does not exceed anticipated losses from calculated liner leakage, evaporation, plant transpiration and discharge. All monitoring data and calculations must be documented and submitted to the City of Austin for review.

2. Sedimentation Basins, Filtration Basins and Retention Ponds less than 1,000 square feet in area.

Concrete liners may be used for sedimentation basins, filtration basins and retention ponds less than one-thousand (1,000) square feet in area. Concrete must be five (5) inch thick Class A or better as defined in the City of Austin Standard Specifications and must be reinforced by steel wire mesh. The steel wire mesh must be six (6) gauge wire or larger and six (6) inch by six (6) inch mesh or smaller. An Ordinary Surface Finish (as specified in Item 410.25 of the City of Austin Standard Specifications) is required. When the underlying soil is clay or has an unconfined compressive strength of one-quarter (0.25) ton per square foot or less, the concrete must have a minimum six (6)

inch compacted aggregate base consisting of coarse sand and river stone, crushed stone or equivalent with diameter of three-quarters (0.75) to one (1) inch. Where visible, the concrete must be inspected annually and all cracks must be sealed.

1.6.3 Maintenance and Construction Requirements

- A. ***Maintenance Responsibilities.*** Proper maintenance is as important as engineering design and construction in order to ensure that water quality controls will function effectively. Section 25-8-231 of the Land Development Code requires maintenance be performed on water quality controls facilities when necessary as defined by this section.

Water quality controls required for commercial and multi-family development shall be maintained by the property owner.

~~Maintenance of full sedimentation/filtration basins~~ Water quality control facilities for single family or duplex residential development shall be maintained by the City of Austin once the facilities have been released by the City, unless otherwise ~~approved~~ determined during the review process. For the City to release a water quality control facility, the facility must:

1. be constructed per the approved development plan;
2. meet all applicable requirements of 1.6.3 B, 1.6.3 C of the ECM and 1.2.4 E. of the DCM;
3. complete a one-year warranty period, including the completion of all maintenance and rehabilitation activities identified by the Watershed Protection and Development Review Department; and
4. obtain final warranty release approval from the Watershed Protection and Development Review Department.

The City will ~~be responsible for the maintenance of ponds~~ also maintain water quality control facilities designed to service primarily publicly owned roads and facilities. These ~~ponds~~ water quality control facilities must be designed and built according to the ~~full sedimentation/filtration~~ appropriate city standards configuration.

- B. **Maintenance Requirements - Design and Construction.** The design of drainage facilities (including but not limited to headwalls, open channels, storm sewers, area inlets, and detention, retention and water quality controls and their appurtenances) shall comply with the requirements of Section 1.2.4.E of the Drainage Criteria Manual. In addition, drainage facilities shall comply with the following construction requirements:

1. Drainage or drainage access easements on side lot lines shall be located adjacent to a property line and not centered on a property line.
2. Points of access to water quality facilities shall have a standard City of Austin residential concrete driveway approach and curb cut on the abutting street. A pipe gate is required at the end of the driveway at the ROW limits. See Figure 8-8 of the Drainage Criteria Manual for details.

3. Retention and water quality facilities shall have a staging area not less than eight-hundred (800) square feet in area if the storage volume of the pond exceeds two-thousand (2,000) cubic feet. The staging area shall be located adjacent to the detention, retention or water quality facility, and access drive and be within an access easement. The staging area may be cleared, graded and revegetated, with slopes not exceeding ten (10) percent in any direction.
4. All pond bottoms, side slopes, and earthen embankments shall be compacted to ninety-five (95) percent of maximum density in accordance with COA Standard Specifications. Side slopes for earthen embankments shall not exceed three to one (3H:1V). Rock slopes may exceed these limits if a geotechnical report warrants a deviation. Actual field conditions may override the geotechnical report. Concrete walls shall be built to COA Standard Specifications. Expansion joints on free standing walls shall have water tight seals as needed. Earthen pond and channel bottoms must have slopes greater than two (2) percent.
5. Free-standing structural walls/facilities located on or adjacent to a residential lot shall not be greater than six feet in height.
6. Refer to section 8.3.4 of the Drainage Criteria Manual for additional safety criteria for storm water management facilities, including water quality facilities and storm water management infrastructure.
7. Sediment removed from detention, retention, or water quality facilities may be disposed of on-site if properly stabilized according to the practices outlined in the erosion and sedimentation control criteria found in Section 1.4.0 of this manual. An off-site disposal site must either be an approved landfill or be issued a permit through the Watershed Protection and Development Review Department.
8. The temporary erosion and sedimentation control plan must be configured to permit construction of detention, retention or water quality facilities while maintaining erosion and sedimentation control.
9. ~~No~~ If runoff is to enter the sand-filtration chamber of the a water quality sedimentation/filtration basin control facility prior to completion of site construction and revegetation, Construction runoff may be routed to the sedimentation chamber but outflow from this structure shall bypass the sand filtration basin. It should be noted that good inspection and maintenance of all temporary erosion/sedimentation controls are essential required, as described in the Environmental Criteria Manual Section 1.4.1.2.E.3, to prevent heavy sediment loads caused by home construction from clogging the filtration media.
10. In all cases, trees shall be preserved according to the requirements of Section 3 of the Environmental Criteria Manual. The access drive and staging area shall be designed to preserve trees 8" (inches) in diameter and greater to the maximum extent possible. Trees 8" in diameter and larger shall be surveyed and shown for the proposed access easement at the time of construction plan permitting.

C. Major Maintenance Requirements.

1. Sedimentation and Detention Basins.

- a. Silt should be removed when the accumulation exceeds six (6) inches in sediment basins without sediment traps. In basins with sediment traps, removal of silt shall occur when the accumulation exceeds four (4) inches in the basins, and the sediment traps shall be cleaned when full. In detention basins, silt shall be removed and the basin restored to original lines and grades when standing water conditions occur or the basin storage volume is reduced by more than 10%.
- b. Accumulated paper, trash and debris should be removed every six (6) months or more often as necessary to maintain proper operation.
- c. Vegetation within the basin shall not exceed eighteen (18) inches in height at any time, except as called for in the design.
- d. The basin shall be inspected annually and repairs shall be made if necessary.
- e. Corrective maintenance is required any time a sedimentation basin does not drain the equivalent of the Water Quality Volume within sixty (60) hours (i.e., no standing water is allowed).
- f. Corrective maintenance is required any time the sediment trap in a sedimentation basin does not drain completely within ninety-six (96) hours (i.e., no standing water is allowed).
- g. To limit erosion, no unvegetated area shall exceed 10 square feet.
- h. Structural integrity of basins shall be maintained at all times.

2. Filtration Basins.

- a. Accumulated paper, trash and debris should be removed every six (6) months or as necessary.
- b. Vegetation within the basin should not be allowed to exceed eighteen (18) inches in height at any time except as called for in the design. This requirement does not apply to Biofiltration Ponds, Rain Gardens, or Water Quality controls that require the physical properties of mature plants for the removal of pollutants from storm water runoff. However, channels designed in accordance with Drainage Criteria Manual Section 6.3.2 still must adhere to the vegetation height limit of 18 inches. In addition, no trees or woody vegetation shall be allowed on a dam (or levee/floodwall). The definition of a dam is found in the Drainage Criteria Manual Section 8.3.4. Refer to Drainage Criteria Manual Section XXX (to be developed) for additional restrictions on vegetation related to dam safety.
- c. Corrective maintenance is required any time draw-down does not occur within thirty-six (36) hours after the sedimentation basin has emptied.
- d. The basin should be inspected annually and repairs should be made if necessary.

3. Wet Ponds.

Due to the nature of wet ponds being full of water when in operation, the need for maintenance is not easily visible. However, when the ponds are built in stable

upland areas, the need for maintenance of these ponds should be infrequent. Accumulation of sediment in the basin is the primary reason the pond will require intensive maintenance. Because of this, very careful attention should be paid to adequate, well-maintained erosion and sedimentation controls in the contributing drainage area during construction. This, in combination with the sediment forebay, should prevent the requirement of maintenance of the main pool soon after the pond is put online. The following are guidelines for pond maintenance:

During Site Construction - The sediment load to the sediment forebay shall be closely monitored after every storm event. If heavy sediment loads are detected during an inspection, the source should be corrected. Sediment shall be removed from the sediment forebay when one-third of the forebay volume is lost.

Upon Completion of Site Revegetation - Any sediment build-up (greater than 5% volume loss) shall be removed from the forebay upon completion of site revegetation. The sediment build-up in the main pool shall be checked and if more than ten percent of the volume is lost, it should be cleaned at that time.

Every Three Months for the First Two Years - During the three month initial inspection cycle, if more than fifteen percent of the volume of the forebay is lost, it shall be cleaned at that time.

Every Three Months - Turf areas around the pond should be mowed. Accumulated paper, trash, and debris shall be removed every three months or as necessary. Cattails, cottonwoods, and willows can quickly colonize shallow water and the edge of the pond. These species, or any areas of plant overgrowth may be thinned at this time or as needed.

Annually - The basin should be inspected annually for side slope erosion and deterioration or damage to the structural elements. Any damage shall be repaired. Large areas, which have dead or missing vegetation, shall be replanted.

Every Three Years - The sediment build-up in the sediment forebay shall be checked. The sediment forebay shall be cleaned if more than one-third of the forebay volume is lost.

Every Six Years - The sediment build-up in the main pool shall be checked. Sediment shall be removed from the main pool when twenty percent of the main pool volume is lost.

4. Retention-Irrigation Systems.

- a. Sediment must be removed from the retention basin, splitter box and wet wells, when accumulations exceed six (6) inches in depth.
- b. To the greatest extent practicable, irrigation areas are to remain in their natural state. However, vegetation must be maintained in the irrigation area such that it does not impede the spray of water from the irrigation heads. Tree and shrub trimmings and other large debris must be removed from the irrigation area in order to harvest and remove nutrients from the system. See requirements in 1.6.7.D.3.(g) and (h) regarding requirements for soil and vegetation in irrigation areas.

- c. The pumps and irrigation system must be inspected or tested a minimum of six (6) times per year to show all components are operating as intended. In particular, sprinkler heads must be checked to determine if any are broken, clogged, or not spraying properly. All inspection and testing reports must be kept on site and accessible to the City of Austin.

1.6.4 Types of Water Quality Controls and Selection Criteria Structural Control Standard and Criteria for Fee-in-Lieu of Structural Controls in Urban Watersheds

A. Introduction. Sedimentation/filtration is the primary structural water quality control to reduce non-point source pollution in Urban, Suburban, Water Supply Suburban and Water Supply Rural Watersheds. In the Barton Springs Zone, non-degradation water quality controls are required (Please refer to Section 1.6.9 for design criteria for non-degradation controls). Innovative controls may be acceptable pursuant to § 25-8-151 of the Land Development Code (Innovative Management Practices). However, these systems must be approved by the Director of the Watershed Protection and Development Review Department (WPDR). The guidelines for several alternative controls are described in section 1.6.7.

~~A. **Sedimentation/Filtration Systems.** Sedimentation/filtration systems are the primary water quality control structures. In these systems, the water quality volume is directed to a sedimentation structure followed by a filtration basin; subsequent additional runoff is diverted to a stormwater detention basin as specified in the Drainage Criteria Manual. The sediment basin is required prior to the filtration basin in order to ensure the long term effectiveness of these systems by protecting the filter media from excessive sediment loading. Two configurations of filtration systems are described in Section 1.6.5.~~

~~In full sedimentation/filtration systems, the sedimentation structure is a basin designed to hold the entire water quality volume and to release the water quality volume to the filtration basin over an extended draw down period.~~

~~In partial sedimentation/filtration systems, a sedimentation chamber is located upstream of the filtration basin which is not required to hold the entire water quality volume and will not incorporate an extended draw down period. This system is designed to remove the heavier sediment and trash litter only and may require more intensive maintenance than the full sedimentation systems. However, partial sedimentation/filtration systems require less depth than the full sedimentation system and may be applicable where topographic constraints exist.~~

~~Full sedimentation/filtration systems shall be required where the City is responsible for maintenance unless topographic constraints make this design unfeasible. Unfeasible is considered: assuming (for the purposes of this selection process only) a maximum ponding depth of three (3) feet in the sedimentation basin, if it is not feasible to obtain an outlet for the drainage from the filtration basin within one hundred (100) feet of the crest of the filtration embankment, then the partial sedimentation/filtration configuration system may be used. If the City is not to be responsible for maintenance of the pond system, either configuration is allowable.~~

~~B. **Wet Ponds.**~~

~~The design of wet ponds for stormwater quality and quantity control may, more than any other control, requires more planning and thoughtful design. When properly designed, wet ponds are~~

~~highly effective in removing stormwater pollutants and can add to the aesthetics of a site or neighborhood. These systems can also be used when the grade of the site is relatively flat. A drawback with these systems can be the long term maintenance of the facility. Proper measures must be taken to reduce the sediment load, which can be the largest single factor which contributes to the need for maintenance of a wet pond.~~

~~The design goal for wet ponds is to have a permanent pool with an average minimum hydraulic residence time of 14 days. This capturing and holding of runoff allows settling of suspended solids and biological uptake of nutrients.~~

~~Section 1.6.6(C) outlines the design criteria for wet ponds. When wet ponds are designed to this criteria, they are assumed (based upon local monitoring data) to provide a level of water quality treatment equivalent to sedimentation/filtration. Specific removal efficiency information will be provided when additional monitoring data is available.~~

~~A wet pond, when designed and maintained according to the following criteria, will not become a critical environmental feature as defined by the City of Austin.~~

~~D._____~~

B. Criteria for Acceptance of Fee-in-Lieu of Structural Controls.

Urban Rule for Water Quality Controls. The City recognizes that incorporating structural water quality control facilities into some urban watershed land development projects can be difficult. In response to these challenges, Section 25-8-214(C) of the Land Development Code requires the Director to review and accept or deny projects to pay into the Urban Watersheds Structural Control Fund in lieu of on-site controls. The funds received under this program have and will be used to study, design, implement, and construct urban water quality improvement projects. This program is only for development within an urban watershed as defined by Section 25-8-2 of the Land Development Code.

1. Urban Watersheds Structural Control Fund Acceptance Guidelines

a. Categories for Participation

Type I – The City will strongly consider allowing urban developments that are classified as Type I to participate in the fee-in-lieu program. Type I development features include, but are not limited to one or more of the following:

- Commercial development sites of 1 acre or less
- Single family development of subdivisions 2 acres or less
- Development with run-off that sheet flows over pervious cover, prior to being concentrated
- Development that is likely to be treated by an existing or future regional water quality facility

Type II – The following Type II developments will in most cases be required to satisfy the water quality requirements through the use of on-site water quality

controls. Type II development features include, but are not limited to one or more of the following:

- No or minimal existing impervious cover
- Substantial redevelopment
- Adjacent to an open channel stream
- Within 500 feet of Town Lake

b. Special Conditions. In addition to the specific criteria given above, the applicant should note the following conditions which could arise:

- Should a regional facility be committed to its maximum capacity, an applicant may (at the City's discretion) increase the capacity through approved modifications. The funding of any such modifications will be the responsibility of the applicant, and shall be credited towards any fees that are required.
- Existing on-site water quality facilities may be removed if the development is approved to participate in the fee-in-lieu program and the WPDRD approves such removal.

c. Participation Fees. Participation fees are calculated by the applicant at the time of project submittal. The fee schedule will be posted within the Land Use Review Division. Any increase will be posted at least 30 days prior to enactment. The present fees for participation are listed in Appendix T and are revised by the annual adjustment factor based on the construction cost index. Participation fees received under this program will be used by the City to study, design, implement, and construct urban water quality improvement projects.

After a development is accepted for participation, fees shall be paid in accordance with the following:

Commercial Site Development.

For commercial site development, payment (cash or cashier check only) must be made prior to issuance of a development permit.

Single Family and Duplex Subdivisions.

For single-family subdivisions which do require the construction of streets or drainage facilities, a letter of credit must be posted with the Watershed Protection and Development Review Department in an amount equal to the total participation fee prior to final plat approval. This letter of credit must be replaced by cash prior to construction plan approval. For single-family subdivisions which do not require the construction of streets, payment (cash or cashier check only) must be made prior to final plat approval.

In conjunction with payment of fees, the agreement shown in Appendix T shall be signed and act as a binding agreement between the applicant and the City.

~~E. **Retention/Irrigation Systems.** Retention/Irrigation systems are designed to capture the required water quality volume and irrigate it on a designated area over a specified period of time following a rain event. This method of treatment may be used to comply with the requirements~~

~~for meeting the non degradation standards applicable in the Barton Springs Zone found in Section 1.6.9.3 of this manual.~~

~~G. *Vegetative Filter Strips.*~~

1.6.7 Alternative Innovative Water Quality Controls

Introduction

Innovative, or alternative, water quality controls are eligible for water quality credit pursuant to § 25-8-151 of the Land Development Code (*Innovative Management Practices*). The following innovative practices have been reviewed and approved by the Watershed Protection and Development Review Department. Acceptance of and the amount of credit allowed for such practices is based on :

- technical merit
- compliance with requirements for water quality protection and improvement
- resource protection and improvement
- advantages over standard practices
- anticipated maintenance requirements

In urban watersheds the amount of credit for the practices described below can be applied as either a reduction in the size of a water quality control or a reduction in the fee-in-lieu cost. The basic credit equation is:

$$WQC = IAF * BMPDF$$

- WQC = Water Quality Credit, a value between 0 and 1, with 1 meaning 100% credit
- Where IAF is the Impervious Area Factor, or the fraction of total impervious area treated by the control.
- BMPDF is the BMP Design Factor, a measure of the degree of design equivalency with sedimentation-filtration systems. Values are on a scale of 0 to 1, with 1 meaning 100% credit.

For two of the practices, porous pavement for pedestrian use and non-required vegetation, the water quality credit can only be applied as a reduction in site impervious cover.

The BMPDF factor will vary with each individual innovative control, as described below. Credit may be restricted or disallowed in some cases for watersheds in the Barton Springs Zone and Barton Springs Contributing Zone.

A. **Retention/Irrigation Systems.** A retention/irrigation water quality treatment system consists of two primary components: (1) a basin which captures and isolates the required volume of stormwater runoff; and (2) a distribution and land application system which generally utilizes pumps, piping and spray irrigation components. When properly designed, this system is effective in removal of pollutants through settling in the retention basin and contact with vegetation, air

and soils in the irrigation process, as well as in mitigating stream-bank erosion as required by Section 1.6.8 of the Environmental Criteria Manual. The effectiveness of this BMP at meeting required pollutant removal efficiencies is based upon the following criteria being met.

1. Minimum Design Criteria for the Retention Basin. Information on water quality volume, diversion structures, and lining requirements can be found in the Environmental Criteria Manual Section 1.6.2, General Design Guidelines. In addition, applicable requirements of Section 1.6.3, Maintenance and Construction Requirements must be incorporated in the design.

a. Retention Basin Volume. The basin must be of sufficient size to capture and hold the required capture volume. Retention basins are designed to capture and hold the water quality volume routed to them via diversion structures. For development in the Barton Springs Zone, refer to Section 1.6.9.3E. of this manual for the required capture volume.

b. One-Hundred Year Storm. A bypass capable of conveying the 100-year storm around the basin must be provided.

c. Lining. A liner may be required for a retention basin in accordance with Section 1 of the ECM. The liner must be designed in accordance with Environmental Criteria Manual Section 1.6.2C., Basin Liners.

d. Erosion Prevention. The inlets to the retention basin must be designed to prevent erosion of the soil and liner. Rock rip-rap or other erosion prevention systems must be placed at the basin inlet to reduce velocities to less than three feet per second.

e. Access Ramp. A maintenance access ramp, as described in Environmental Criteria Manual Section 1.6.3, is required for all facilities.

2. Minimum Design Criteria for Wet Well and Pumps.

a. Pumps.

(1) The retention basin must be emptied by pumping within 72-hours after a rain event ends. Emptying of the retention basin must not begin sooner than 12 hours after the end of the rainfall event.

(2) Pumps must be capable of delivering the required volume of water at the necessary rate and pressure to the irrigation system in the designated time period. Pumps and wet well must be sized to minimize the number of on and off cyclings of the pumps.

(3) A dual pump system must be provided, with each pump capable of delivering 100 percent of the design capacity. Plug valves must be located outside the wet well on the discharge side of each pump to isolate the pumps for maintenance and for throttling if necessary. Butterfly valves and gate valves must not be used. Pumps must be selected to operate within 20% of their best operating efficiency.

(4) The pumps must alternate on start up. A manual control must be provided so both pumps can be turned on if necessary. A high/low-pressure pump shut off system (in case of line clogging or breaking) shall be installed in the pump discharge piping.

(5) Float controls or submersible transducers must be provided to control operation of the pumps. Three control settings must be used: (1) one for starting the pump, (2) one for shutting off the pump at the normal low water level, and (3) one for back up shut off of the pump in case the first shut-off fails.

(6) An alarm system shall be provided consisting of a red light located at a height of at least five feet above the ground level at the wet well. The alarm shall activate when:

- (a) The high water level has been maintained in excess of 72 hours.
- (b) The water level is below the shutoff float and the pump has not turned off.
- (c) The high/low-pressure pump shut off switch has been activated.

The alarm must be vandal proof and weather resistant. If the system is to be privately maintained, a sign must be placed at the wet well clearly displaying the name and phone number of a responsible party that may be contacted if the alarm is activated.

b. Wet Well.

(1) A separate wet well outside of the basin must be provided for the pumps. The wet well must be constructed of precast or cast in place concrete. Complete access to the pumps and other internal components of the wet well for maintenance must be provided through a lockable cover. An isolation plug valve to prevent flow from the retention basin to the wet well during maintenance activities must be provided.

(2) Calculations must be provided with the design showing that the wet well will not float under saturated soil conditions. The top elevation of the well must be at or higher than the walls or berms enclosing the retention pond. The wet well and pump must be designed to be low enough to completely evacuate the retention pond and a space of at least two feet must be available below the bottom of the pump. The two-foot minimum space below the bottom of the pump may be waived if the applicant demonstrates that adequate filtration of the water quality volume is provided.

(3) The pump installation in the wet well and access to the wet well must be designed to allow the pumps to be removed using truck-mounted hydraulic hoist equipment or a portable "A-frame." A system must be provided to allow pump removal without entering the wet well. If rails are used they must be stainless steel.

c. Intake Riser. Prior to entering the wet well, stormwater must pass through an appropriate intake riser with a screen to reduce the potential for clogging of distribution pipes and sprinklers by larger debris (e.g. cups, cans, sticks). The intake riser and screen shall be designed as shown in Figure 1-54 in the Appendices of this manual.

3. Minimum Design Criteria for the Irrigation System.

a. Irrigation Timing. The retention basin must be emptied within 72-hours after a rain event ends. Irrigation must be initiated no sooner than 12 hours after the rain event ceases. The irrigation controller must be set to provide alternating, equivalent irrigation

and rest periods until the basin is emptied. The time of irrigation on any area must not exceed the rest time. Continuous application on any area must not exceed two hours. Division of the irrigation area into two or more sections such that irrigation occurs alternately in each section is an acceptable way to meet the requirement for a rest period.

b. Irrigation Rate. The rate at which the soil can accept the irrigated storm water must be derived from the permeability listed in the U.S. Department of Agriculture National Resources Conservation Service Soil Survey for the county, location, and soil type verified to be present at the irrigation site. If a range is given, the minimum permeability rate is to be used, not to be less than .03 inches/hour. Other methods of demonstrating site-specific permeability may be approved by the Director.

c. Irrigation Area. Calculations must be provided which demonstrate that adequate irrigation area will be provided based on the application rate, soil permeability, water quality volume, and the actual irrigation time. For publicly maintained facilities the irrigation area and system must be included within the water quality easement.

d. Irrigation Area Slope. Irrigation must not occur on land with slopes greater than 10%.

e. Piping and Valves.

(1) All irrigation system distribution and lateral piping (i.e. from the pumps to the spray heads) must be Schedule 80 PVC. All pipes and electrical bundles passing beneath driveways or paved areas must be sleeved with PVC Class 200 pipe with solvent welded joints. Sleeve diameter must equal twice that of the pipe or electrical bundle.

(2) Valves. All valves must be designed specifically for sediment bearing water, and be of appropriate design for the intended purpose. All remote control, gate, and quick coupling valves must be located in ten-inch or larger plastic valve boxes. All pipes and valves must be marked to indicate that they contain non-potable water. All piping must be buried to protect it from weather and vandalism. The depth and method of burial must be adequate to protect the pipe from vehicular traffic such as maintenance equipment. Velocities in all pipelines should be sufficient to prevent settling of solids. The irrigation design and layout must be integrated with the tree protection plan and presented as part of the Site Plan or Subdivision Construction Plan.

(3) Systems must include a plug valve to allow flushing at the end of every line.

f. Sprinklers. All sprinkler heads must have full or partial circle rotor pop-up heads and must be capable of delivering the required rate of irrigation over the designated area in a uniform manner. Irrigation must not occur beyond the limits of the designated irrigation area. Partial circle sprinkler heads must be used as necessary to prevent irrigation beyond the designated limits. Sprinkler heads must be capable of passing solids that may pass through the intake. Sprinkler heads must be flush mounted and encased within a 2 feet x 2 feet concrete housing capable of protecting the head from mowing and service equipment (see Appendix V, Figure 1-59F for an example).

g. Vegetation. The irrigation area must have native vegetation or be restored or re-established with native vegetation, unless approved by the Director. These areas must not receive any fertilizers, pesticides, or herbicides. If landscaped areas are used for irrigation, fertilizers, pesticides, or herbicides must not be applied to those areas and this limitation must be outlined in the Integrated Pest Management (IPM) plan. For publicly maintained systems, fencing or signs must be installed to limit unauthorized use of the irrigation area. If signs are installed, they must include the phrase "Stormwater Irrigation Area – No Trespassing."

h. Soil. A minimum of 12 inches of soil, with the identified permeability rates, must be present in the irrigation area. Soil enhancement is allowed to achieve this requirement. A soils report must be provided and must include at a minimum a soils map verifying soil types in the irrigation area, permeability rates, soil depths, percent of coarse fragments gravel size (2.0 mm diameter) and larger, found on the soil surface and in the subsurface soils, depth of roots, locations of borings or trenches, photographs of exposed soils, location and type of soil enhancement performed, soils testing results, etc. A site visit may be conducted by the city to confirm soil conditions, including when representative trenches have been opened or borings are being conducted. City staff must be given at least 72 hours notice of when borings or trenches are to be backfilled.

i. Geological Features. The irrigation area must not contain any Critical Environmental Feature Buffer Zones.

j. Irrigation Area Buffer. A buffer area of un-irrigated vegetation must be provided downstream of the irrigation area to treat any runoff that may occur from the irrigation area during heavy rainfall or from excessive irrigation. This area must be a minimum of 50 feet in length (in the direction of flow) and be adjacent to all downstream edges of the irrigation area. As an option, a diversion system (e.g. a swale or berm) may be provided to route any runoff to the retention basin. This diversion system must be designed to carry the runoff from the two-year storm. Alternatively, the irrigation area may be located upstream from the development such that any runoff will be routed to the retention pond.

4. Manuals and As-Built Plans.

a. The applicant must provide two complete copies of an Operations Manual for the pumps and irrigation system, which must include:

(1) Pump curves, electrical schematics, pump and instrument technical information, components of the control panel, pump maintenance recommendations with required frequencies, irrigation controller operation instructions and a written warranty.

(2) As-built plans of the retention basin, wet well, pumps, piping and irrigation system. The plans must show the location, size, and type of all pipes, valves, wiring, wiring junctions, and sprinkler heads.

For retention-irrigation systems that are to be maintained by the City of Austin, both sets of plans and manuals shall be submitted to the Field Operations Division of the Watershed Protection and Development Review Department.

For systems that are to be maintained privately, one set of plans and one manual shall be included with the operating permit application and the second set of plans and one manual shall be retained on site at all times.

B. Vegetative Filter Strips.

1. Introduction. Vegetative Filter Strips (VFS) are typically used in areas with relatively low-density development as a passive low maintenance means of protecting nearby receiving waters from marginally increased pollutant loads. They are designed to treat uncontrolled runoff; the procedures described below should not be used when vegetated areas function as a secondary treatment (e.g. vegetated area receiving discharge from a sand filtration basin). Throughout this division, the acronym VFS and the term filter strip is used when referring to vegetative filter strips. They are referenced in the SOS rules as a method for controlling non-point source pollution in watersheds within the Barton Springs Zone. Vegetative Filter Strips may also be appropriate for use in other watersheds to provide stormwater treatment equivalent to sedimentation/filtration systems. For filter strips to work effectively sheet flow shall be maintained and maximum velocities (see Design Requirements) in the filter strip shall not be exceeded. This requirement will limit the size and/or impervious cover that is practical for treatment. Vegetated areas that are designed to pond runoff are not considered to be Vegetative Filter Strips and will require different design procedures (not described here). The VFS shall be restricted from development or any use that may negatively affect the function of the VFS (e.g. intensive recreational uses, pet use, etc.). This can be accomplished through the dedication of an easement or dedicated conservation lot for single family construction plans and, for site plans, by clearly labeling the VFS area by shading or cross hatching on the site plan sheet(s). In either case, the site plan must contain provisions to physically restrict access to the easement or conservation lot (e.g. fences, bollards, signage). An approved Integrated Pest Management Plan with a recorded Restrictive covenant is required. It is extremely important that the VFS not be over-irrigated and that fertilizer and chemical use be minimized; otherwise the VFS may become a source of pollution instead of a treatment best management practice (BMP).

2. General Design Guidelines. Filter strips must be sized correctly, have the proper slope, utilize sheet flow that does not exceed a maximum velocity, have appropriate soil type and thickness, and have appropriate vegetation of the proper density. The VFS shall not receive runoff until after the contributing drainage area has been stabilized to prevent erosion and sedimentation.

Filter strips can be classified as either natural or engineered. In general, natural filter strips utilize existing vegetated areas whereas engineered filter strips are constructed features. Engineered vegetative filter strips differ from natural vegetative filters in that they are specifically designed and constructed to maximize the water quality benefits of this practice, particularly in areas where adequate buffers do not exist naturally or cannot be preserved.

3. Design Requirements: Size, Slope and Structure. The width (perpendicular to direction of flow) of the VFS should be as wide as the contributing drainage area.

The hydraulic loading rate applied to the VFS for the two-year, three-hour rainfall event should not exceed 0.05 cfs/ft width, calculated as the peak flow rate divided by the VFS width.

The length (dimension in direction of flow) of the vegetative filter should be at least 25 feet, and limited to a maximum of 100 feet. If this length is exceeded additional flow spreading should be provided to maintain sheet flow conditions.

Vegetative filter strips shall be sized per the following table.

Vegetative Filter Strip (VFS) Sizing		
Acres of VFS per Acre of Contributing Drainage Area		
Contributing Area Impervious Cover	SOS	Sand Filtration Equivalency
10%	0.21	NA
15%	0.28	NA
20%	0.36	0.32
25%	0.45	0.40
30%	0.55	0.49
35%	0.66	0.58
40%	0.78	0.68
45%	0.90	0.80
50%	1.04	0.91
55%	1.18	1.04
60%	1.34	1.17
65%	1.49	1.31

70%	1.67	1.46
75%	1.84	1.61
80%	2.03	1.77
85%	2.22	1.94
90%	2.42	2.12
95%	2.63	2.30
100%	2.85	2.49

Filter strips should have a minimum slope of 1%. Engineered filter strips should be constructed to maintain a constant slope that does not exceed 10%. Where existing vegetated areas are to be used (“Natural” VFS) the average slope of the VFS should not exceed 10%, with no portion exceeding 15%.

A level spreader device should be used to facilitate overland sheet flow. To ensure that runoff enters the VFS instead of flowing around it, the elevation of the leading edge of the VFS should be lower than the elevation at which flow is discharged from the level spreader.

4. Landscape Elements. Vegetative filter strips shall have a minimum topsoil depth of four inches, but greater depth is preferred. If soil must be added to achieve the minimum depth, the imported soil shall be clean and free of weeds (including seed). Compost-amended soils (25% compost) shall be used when turfgrasses will be used as the vegetation, or if the native soils are classified (per NRCS) as type C or D. The condition, type, structure and quality of the soil shall be conducive to infiltration and to plant growth. Soil, if compacted, must be loosened. Compact soils are defined as those having a reading of greater than 300 psi at a depth of three inches (using a soil compaction penetrometer). Non-compacted soils, or loosened soils, shall have a reading of less than 300 psi.

The filter strip should have dense vegetative cover (minimum 95% coverage as measured at the base of the vegetation). Suitable vegetation for VFS includes grasses, forbs, shrubs and trees. The use of native grasses is strongly recommended due to their resource efficiency and their ability to enhance soil infiltration. In the case of natural wooded areas where 95% vegetative cover is not present, a minimum of four inches of leaf litter, mulch or other organic matter must be in place. In these areas, lower tree limbs should be removed, the canopy opened and the area seeded with appropriate grasses and forbs in order to enhance ground cover.

Native grasses used for filter strips shall be a minimum of six inches in height (four inches if the VFS slope is 2% or less), unless it can be demonstrated that flow across the strip will not submerge the vegetation. Turfgrasses used for engineered vegetative filter strips shall be a minimum of two inches in height.

Existing vegetation can be used as filter strips if all other design criteria are met. An appropriate selection of plants will vary with site conditions and the user is referred to growgreen.org for guidance regarding appropriate plants and their use. The VFS should not include invasive and pest species (e.g., Johnson Grass). To establish a dense and healthy vegetative cover, temporary irrigation and limited fertilization may be required.

Signage should be provided to delineate the boundaries of the filter strip, and to notify residents, inspection, and maintenance staff of its function and proper management.

5. **Maintenance Requirements.** Filter strips shall be managed so that a dense, healthy vegetative cover is preserved. Once established, filter strips using native grasses shall be maintained without pesticides and fertilizers. Turfgrass filter strips may be managed with a minimal amount of irrigation and fertilization (not more than 1 lb. of nitrogen per 1,000 square feet per year) however no herbicides or pesticides shall be applied.

Bare spots and areas of erosion identified during inspections must be replanted and restored to meet specification. If sediment accumulates on the vegetative filter strip then it must be removed. Any disturbance to the filter strip as a result of maintenance procedures (or other reasons) shall be repaired, including re-establishment of the vegetation.

C. **Biofiltration.**

1. **Introduction.** Biofiltration ponds are a water quality control best management practice (BMP) that uses the chemical, biological, and physical properties of plants, microbes, and soils for removal of pollutants from stormwater runoff. Biofiltration is a critical component of Low Impact Development (LID). LID is a philosophy of development in which steps are taken to maintain predevelopment hydrology, as near a possible. Green space is made functional to keep storm water onsite, to minimize runoff and to employ natural processes for water quality improvement.

A biofiltration system utilizes several treatment mechanisms for removing pollutants from stormwater runoff. As with a sand filtration system, a sedimentation basin provides pre-treatment of runoff in order to protect the biofiltration media from becoming clogged prematurely by sediment loads. Likewise, sand filtration and biofiltration both remove pollutants through physical filtration. The primary difference between the two is that the presence of a biological community of plants and microorganism in a biofiltration system can theoretically provide more treatment of runoff. Another benefit of having a plant community is that the permeability of the biofiltration media may be sustained for longer periods of time without maintenance.

The health of the biological (plant and microorganism) community is intimately tied to the soil-water-moisture conditions of the filtration media, thus it is important to have a basic understanding of soil-water-plant dynamics, in particular “available water capacity.” During periods of rainfall, soils are often saturated, meaning the pore spaces are largely filled with water. The volume of water held in a saturated soil can be estimated as being equal to the porosity, or the volume fraction of pores. Most soils have similar porosity values, in the range of 0.4 – 0.5, i.e., pores represent 40-50% of the total soil volume. During saturated conditions, plants are largely inactive due to the absence of oxygen in the soil. Once rainfall and runoff have ceased, water will gravity drain out of the soil through larger pores down to a level known as “field capacity.” At field capacity, reaeration of the soil has also typically begun, and plant (and microorganism) activity resumes. The plant uptake and evapotranspiration processes will then proceed and, without additional water inputs, the soil wetness will decrease to a level known as “wilting point”, a level below which many plants cannot survive for extended periods. Thus, to sustain a healthy plant and microorganism community, the soil wetness should be maintained between the “field capacity” and “wilting point” levels; this range is known as the “available water capacity” of the soil. Compared to most soils, sand has a low available water capacity, thus it has a limited ability to provide “biological” treatment of pollutants (see following table).

Soil Texture	Available Water Capacity ft/ft
Coarse Sand and Gravel	0.02 – 0.06
Sand	0.04 – 0.09
Loamy Sand	0.06 – 0.12
Sandy Loam	0.11 – 0.15
Fine Sandy Loam	0.14 – 0.18
Loam and Silt Loam	0.17 – 0.23
Clay Loam and Silty Clay Loam	0.14 – 0.21
Silty Clay and Clay	0.13 – 0.18

A biofiltration pond consists of a splitter box diversion structure at the flow entrance, a flow spreading structure, a sedimentation chamber, separator element, a biofiltration media filtration chamber with an underdrain piping system beneath the biofiltration media, an outlet structure, and native vegetation selected for tolerance to ponding and dry soil conditions. Biofiltration ponds can provide equivalent treatment to a standard sedimentation/filtration system but are not acceptable as a primary method for controlling non-point source pollution in watersheds within the Barton Springs Zone or Barton Springs Contributing Zone.

For biofiltration ponds to work effectively maximum velocities into the sedimentation chamber shall not be exceeded. This requirement will limit the size and amount of impervious cover that is practical for treatment. Biofiltration ponds are relatively low maintenance once native plantings are well established and should be restricted from any use that may negatively affect the function of the biofiltration pond (e.g. pet use, application of herbicides and pesticides, excessive mowing, etc.). To ensure this, an

approved and recorded Integrated Pest Management plan will be required for the drainage area up to and including the pond area.

2. Basin Surface Areas and Volumes.

The following equation gives the minimum surface area required for the filtration basin:

$$A_f = WQV * L / kt(H/2 + L)$$

Where,

- A_f = required surface area of the media in square feet
- WQV = the water quality volume in cubic feet as defined in section 1.6.2.
- L = Depth of the soil media (typ. 1.5 feet)
- k = Hydraulic Conductivity (3.5 ft/day for "full" sedimentation-filtration systems; 2 ft/day for "partial" systems)
- H = Maximum head over the soil media (feet)
- t = Drawdown Time (two (2) days)

As can be seen the hydraulic conductivity for biofiltration media is assumed to be the same as sand filtration. This is a reasonable assumption based on several factors (but the assumptions may change in the future as monitoring data becomes available). For sand filtration, the assumptions reflect the fact that the media will typically experience a significant reduction in conductivity over time due to surface crusting and clogging of void spaces by lower-permeability silt and clay particles. For example, the hydraulic conductivity of sand that does not have sediment-laden water applied can exceed 100 ft/day, but values of less than 1 ft/day have been observed for sand filters treating stormwater. For biofiltration systems it will be difficult to estimate the actual hydraulic conductivity, primarily because the media will be an artificial soil mixture whose texture and structure may be different than true soils. Testing of various soil mixtures conducted by the City of Austin, the University of Texas Center for Research in Water Resources, and others have documented that candidate soil mixtures generally drain slower than sand, but at rates greater than 3.5 ft/day. If surface crusting and clogging can be minimized, which should be the case for biofiltration systems due to the presence of vegetation, it is reasonable to assume that the hydraulic conductivity of biofiltration systems should be comparable to sand filters.

Full Sedimentation-Biofiltration Systems.

In these systems the entire water quality volume is stored in the sedimentation basin, which discharges the volume to the biofiltration basin in 48 hours. See 1.6.5.A. for additional design criteria and Figure 1A, Full Sedimentation/Biofiltration Pond, for general details.

Based on the equation and assumptions given above, the minimum surface area required for the biofiltration basin is:

$$A_f = WQV / (7 + 2.33 * H)$$

Where "A_f" is the filtration area in square feet, "WQV" is the water quality volume in cubic feet as defined in section 1.6.2A, and "H" is the maximum ponding depth in the filtration basin. The assumed maximum ponding depth of the filtration basin should be at least one (1) foot less than the maximum ponding depth in the sedimentation basin, to account for tailwater effects.

Partial Sedimentation-Biofiltration Systems.

The combined volume of the sediment chamber and filtration basin must be equal to the water quality volume, i.e., V_s + V_f = water quality volume where "V_s" is the sediment chamber volume and "V_f" is the filtration basin volume. The volume of the sediment chamber, "V_s", shall be a minimum of 20 percent of the water quality volume. The water quality pond design shall allow enough freeboard to pass the design flow rate for the 100 year storm over the splitter/diversion structure without overtopping of any side walls of the pond, plus an additional 5% of the total fill height or three inches, whichever is greater, to allow for construction irregularities and long term soil settling. The design shall ensure that under no circumstances does the sediment chamber allow water to return to the isolation/diversion structure, i.e., isolation of the water quality volume and minimal mixing must be ensured. See Figure 1B, Partial Sedimentation/Biofiltration Pond, for general details.

Based on the equation and assumptions given above, the minimum surface area required for the biofiltration basin is:

$$A_f = WQV / (4 + 1.33 * H)$$

Where "A_f" is the required surface area of the media in square feet and "WQV" is the water quality volume in cubic feet as defined in section 1.6.2A, and "H" is the maximum ponding depth above the filtration media in feet.

3. Sedimentation Basin/Sediment Chamber Details. The system consists of an inlet structure, flow spreader, vegetative settling area, and separator element.
 - A. Inlet Structure. The inflow of the water quality pond should pass through the splitter structure where the water quality volume is separated (see section 1.6.2B). The water quality volume should be discharged uniformly and at low velocity into the basin/chamber in order to maintain near quiescent conditions which are necessary for effective treatment. It is desirable for the heavier suspended material to drop out near the front of the basin. Flow spreading should occur after the inlet to return flows to sheetflow conditions of a maximum two (2) feet per second for the peak flow rate of the developed

twenty five (25) year storm when entering the basin/chamber. Plantings in the sedimentation basin are to provide resistance to flow and further spread the flows; therefore reducing runoff velocities further to improve settling, biological uptake, and adsorption.

The basin/chamber should have minimum 1% bottom slope to ensure that the pond will drain adequately even after silt accumulation.

- B. Separator Element. The Separator Element structure is required for the Partial Sedimentation Biofiltration pond and should be designed to discharge the flow evenly across the filtration basin. It is recommended that you use five (5) inch by eight (8) inch rock flow spreaders or low gabion structures, two (2) feet wide and six (6) inches to twelve (12) inches deep, with hedgerows located within the structure (see Figure 1B). The outflow side should incorporate features to prevent gouging of the soil media.
4. Biofiltration Basin Details. The Biofiltration media bed filtration system consists of the biofiltration media bed, underdrain piping, and outlet structure.
- A. Biofiltration Media. In order to provide acceptable drainage and plant growth characteristics, the biofiltration media shall meet the following performance criteria:

Porosity $n \geq 0.45$

Saturated Hydraulic Conductivity $k \geq 2$ in/hr

Available Water Capacity $AWC \geq 0.10$

Percent Organic Matter (by weight) of 3 – 5%

The hydraulic conductivity needs to be high enough to provide adequate drainage, support healthy plant growth, and prevent nuisance conditions

The criteria is intended to meet the NRCS definition of soils with “moderate” to “high” available water capacity. The criteria should ensure that the media has sufficient water holding capacity to support vigorous plant growth, enhancing the ability for plants to survive during dry periods. It should also sustain a healthy microorganism population which, in concert with the plants, should enhance biological removal of pollutants in stormwater.

The percent organic matter criterion is needed to ensure healthy vegetation. Most native soils in the Austin area have less than 4% organic matter, and native plants in the area have adapted to surviving in these types of soils. A higher organic matter content is not desirable as nutrients may be exported out of the media; an unacceptable situation for a system intended to *reduce* nutrient loads. The biofiltration media must be certified as meeting the above performance criteria before acceptance by the City.

B. Evaluating Drainage Performance of the Biofiltration Media. The drainage performance of the media can be evaluated using the hydraulic conductivity (k), porosity, and available water capacity (AWC) data. Porosity is a measure of the total void space in the filtration media and, under saturated conditions, the soil moisture content of the media is equal to porosity. By definition, the available water capacity is the difference between the field capacity (FC) and wilting point (WP) soil moisture content levels. Using the symbol θ to denote soil moisture content (in/in), the following terms can be used:

θ_{SAT} = saturated condition

θ_{FC} = field capacity

θ_{WP} = wilting point

It can be assumed that saturated conditions are prevalent in biofiltration systems during rainfall runoff events, because the void space volume of the media is small compared to the runoff volume for most storm events. The portion of the media that is readily drainable by gravity, sometimes labeled effective porosity (n_e), is the difference between the saturated and field capacity conditions, or:

$$n_e = \theta_{SAT} - \theta_{FC}$$

The effective porosity volume be calculated in inches as:

$$V_{drain} = L * (\theta_{SAT} - \theta_{FC})$$

Where L is filtration media depth in inches (typically 18").

In ft^3 as:

$$V_{drain} = Af * L * (\theta_{SAT} - \theta_{FC})$$

Where Af is the filtration media surface area in ft^2 and L is media depth in ft (typically 1.5 ft).

To estimate the travel time for runoff to drain through a media under saturated conditions, assuming no ponding and a free draining underdrain system:

$$TT_{drain} = [L * (\theta_{SAT} - \theta_{FC})] / k$$

This equation is simply a version of Darcy's Law with a hydraulic gradient of 1.

If water is ponded at a height H above the media, the time for the water to drop from H to the top of the media can be estimated using Darcy's Law:

$$TT_{pond} = (H * L) / [k * (H_{avg} + L)]$$

Where $H_{avg} = H/2$

As should be obvious from the above, the volume of water stored in the media below the field capacity does not contribute significantly to gravity drainage; this water is more slowly redistributed into smaller pore spaces in the media, and removed from the system by evaporation and plant transpiration. Thus, this volume of water should typically not be included in drainage calculations.

It should also be noted that the "ponded" travel time equation above does not directly account for water that is stored adjacent to, but hydraulically connected, to the filtration media, e.g., a sedimentation basin.

B. Biofiltration Media Bed with Gravel Layer. The biofiltration media bed for biofiltration basins must be built to the "Sand Bed with Gravel Layer" configuration (substitute biofiltration media for sand and use Figure 1-56 in Appendix V of this manual). The biofiltration media layer is to be a minimum of eighteen (18) inches meeting the specifications stated in Section 4A above. The biofiltration media shall be a uniform mix, free of stones, stumps, roots or other similar objects larger than two inches. No other materials or substances shall be mixed or dumped within the biofiltration area that may be harmful to plant growth, or prove a hindrance to the planting or maintenance operations. Note: Biofiltration media bed depths are final. Consolidation effects must be taken into account. Under the biofiltration media shall be a layer of one-half (0.5) to one and one-half (1.5) inch diameter washed, rounded, river gravel which provides a minimum of three (3) inches of cover over the top of the 6", Schedule 40, PVC underdrain lateral pipes. The soil media and gravel must be separated by a layer of geotextile fabric meeting the specifications listed in Section 1.6.2(C). To avoid compaction of the biofiltration media and promote filtration do not allow heavy equipment in biofiltration area after the biofiltration media has been placed.

Access for cleaning all underdrain piping is needed. Cleanouts with a removable PVC cap are required within fifty (50) feet of every portion of lateral, at collector drain lines, and at every bend. In order to minimize damage to these cleanouts due to maintenance equipment, vandalism, and mowing set the top of the cleanout flush with the top of the biofiltration media bed. At least one lateral must be accessible for cleaning when the pond is full. The full pond cleanout should extend above the water quality elevation and/or be located outside of the water quality volume ponding area. In order to minimize vandalism or other types of damage to this full pond cleanout the use of exposed piping shall be avoided or minimized.

Note: The top surface of the biofiltration media bed must be horizontal, i.e. no grade is allowed.

C. Outlet Structure. The outlet structure controls the water quality volume from the biofiltration basin. The outlet structure shall be designed to provide for a minimum draw-down time of forty eight (48) hours. The draw-down time should

be achieved by installing a removable PVC cap with the appropriate sized orifice at the end of the underdrain pipe (the discharges through the perforations should not be used for draw-down time design purposes). The PVC cap must be accessible for maintenance.

5. **Landscape Design.** Although an essential role of the landscaping is to make the pond attractive, the highest priority shall be to meet the ponds functional requirements. Plants should be selected based on their ability to survive under alternating conditions of inundation and extended dry periods. The landscape elements for the sedimentation basin or chamber may be different than for the biofiltration basin, due primarily to different soil characteristics. Compared to most native soils in the Austin area, the biofiltration media may drain more rapidly, have a greater percent organic matter, and less clay content, but should have comparable water holding characteristics. The selection of plants for the biofiltration media depth will also be limited because the media depth is typically only 1.5 feet, thus plants with large root systems, such as trees, are not appropriate. The soil characteristics and depth in the sedimentation basin or chamber will probably vary widely from site-to-site, and this will have a significant effect on the plant selection.

In general, the biofiltration basin should be planted with native or adapted grasses, and forbs, ~~and shrubs may also be included.~~ Small trees (< 8" diameter at maturity) can be incorporated around the perimeter, above the water quality volume, as long as the underdrain system is protected from penetration by the tree root system. *and*

The embankment does not meet the definition of a floodwall.

Vegetative elements in the sedimentation basin or chamber can be similar, but small trees (< 8" in diameter) can be placed in the floor and side slopes within the water quality volume, if soil conditions and depth are appropriate, and measures are taken to prevent root penetration into the adjacent filtration underdrain system.

Plant Quantities.

The minimum quantity of **total required plants** (rooted) for the pond is described. Place these plants in specific areas according to the following restrictions.

1. **Pond bottom:** Pond bottom shall be vegetated with a uniform cover of turf grass sod or an approved equivalent, with containerized plants interspersed according to Table 1-12. To determine the minimum quantity of total required plants for the biofiltration system, multiply the surface area (in square feet) of the entire pond bottom by ten percent (0.1). This number represents the minimum number of plants to be placed in the pond bottom. These plants must be rooted one-gallon equivalents.
2. **Sedimentation basin:** A minimum of 20% of the total required rooted plants shall be placed in the sedimentation basin.
3. **Filtration basin:** A minimum of 50% of the total required plants shall be placed in the filtration basin. A minimum of 20% of the total required rooted plants shall be comprised of tall herbaceous species. No more than

30% of the total required plants may be medium herbaceous plants. Table 1-12 establishes the plant quantity requirements per plant category for the filtration basin.

4. Additional plants: Additional plants beyond the established minimums are encouraged. Additional plants must comply with other pertinent criteria (i.e. Table 1-18 Plants That Are Not Permitted).

5. Example: The following example demonstrates the minimum plant quantity and location requirements for a pond bottom area of 3,000 square feet.

- Overall Pond requirements

3,000 s.f. x 0.1 = 300 total required plants (one-gallon plants – refer to Table 1-13 for plant size equivalents)

- Sedimentation basin requirements

300 total required plants x 0.2 = 60 plants (minimum) must be placed in the sedimentation basin

- Filtration Basin requirements

300 total required plants x 0.5 = 150 rooted plants (minimum) must be placed in the filtration basin

150 total required plants for filtration x 0.2 = 60 tall herbaceous plants (minimum) must be placed in the filtration basin

300 total required plants x 0.3 = 90 medium herbaceous plants (maximum) are allowable in the filtration basin

300 total required plants x 0.5 = 90 short herbaceous plants (maximum) are allowable in the filtration basin

**Table 1-12
Plant Quantity Requirements – Filtration Basin**

Pond Bottom (PB)		
0.1 x PB sq. ft. = minimum quantity of rooted plants for the entire pond		
Plant Category Refer to Tables 1-15, 1-16, and 1-17 for allowable herbaceous species	Filtration Basin Requirements 0.5 x total reqd. plants (min.)	
	% of total required plants – minimum	% of total required plants – maximum

Tall Herbaceous	40%	No maximum
Medium Herbaceous	-	50%
Short Herbaceous	-	30%
Optional: Designer's choice*	-	10%

*Designer's choice includes plants that are not restricted to the plants listed in tables 1-15, 1-16, and 1-17. (See item 1.6.7 (C) 5.)

Plant Size.

Rooted plants may be provided in bare-root form, sod or in containers. Root mass of bare-root plants must be equal in mass to the equivalent container sizes. For the purpose of fulfilling the required minimum plant quantity, it is assumed that the plants to be installed will be 1-gallon size. Other sizes are acceptable but overall the quantity must be equivalent to the required minimum 1-gallon plants. See Table 1-13 for equivalency.

**Table 1-13
Plant Size Equivalents**

Potential Substitute		Equivalent To	
Quantity	Plant Size	Quantity	Plant Size
1	Five-gallon or larger	4	One-gallon
1	Two or Three-gallon	2	One-gallon
4	4" pots or quarts	1	One-gallon
8	Plugs	1	One-gallon
2	Pieces of sod	1	One-gallon

Plant Spacing.

Table 1-14 establishes specific requirements for the arrangement of plants. There are no minimum spacing requirements. While dense plantings are encouraged, tall plants shall not be spaced so close to each other as to form an impenetrable barrier for maintenance personnel.

**Table 1-14
Plant Spacing Requirements**

Plant Category	Spacing Requirement
Tall Herbaceous	Maximum distance is 13' (4 mtrs) from another tall or medium herbaceous plant
Medium Herbaceous	Maximum distance is 13' (4 mtrs) from another medium or tall herbaceous plant
Short Herbaceous	Maximum width of turf (i.e. short herbaceous plants) is 10' (3 mtrs)

Plant Selection.

Select and locate plants carefully so that they serve their intended function. Both rooted plants and seed are required to meet the landscape requirements of biofiltration. Select and arrange plants carefully so that they serve their intended function. In addition to choosing plants for their aesthetic properties, select plants that:

- Are adapted to the pond hydrology (i.e. periodic flooding and drought)
- Are adapted to the soil types within the pond
- Are suitable for their specific function (e.g. erosion control, filtration, etc.)
- Are durable, resilient and resistant to pests and disease
- Are tolerant of the pollution in stormwater runoff
- Have a root system of the desired type, mass and depth
- Are resistant to weed invasion
- Require minimal maintenance
- Are not invasive

Choose from among the plants listed in Tables 1-15, 1-16, and 1-17 to meet the requirements established in item 1.6.7 (C) 5. Plant Quantities.

Plant Species.

1. **Tall Herbaceous Plants:** This category includes grasses, forbs, sedges and rushes that usually attain a height greater than 4' at maturity. These plants are well-suited for biofiltration. Certain grasses are ideal species for use as hedgerows as well. When spaced closely together (e.g. 3' o.c.) the hedgerow grasses shade the ground so effectively that most weeds cannot survive.

**Table 1-15
Tall Herbaceous Plants**

This table includes grasses, sedges, rushes and forbs that are usually taller than 4' at maturity

Botanical Name	Common Name	Sed	Filt
Andropogon gerardii	Big bluestem	x	x
Andropogon glomeratus	Bushy bluestem	x	
Helianthus maximiliani	Maximilian sunflower		x
Juncus effusus	Soft rush	x	x
Muhlenbergia lindheimeri	Big muhly	x	x
Panicum virgatum	Lowland switchgrass	x	x
Panicum virgatum	Upland switchgrass	x	x
Saccharum alopecuroides	Silver plumegrass	x	
Schizachyrium scoparium	Little bluestem		x
Schoenoplectus acutus	Hardstem bulrush	x	
Sorghastrum nutans	Indian grass	x	x
Spartina pectinata	Prairie cordgrass	x	
Tridens strictus	Longspike tridens		x
Tripsacum dactyloides	Eastern gama grass	x	x
Verbesina virginica	Frostweed	x	x

2. Medium Herbaceous Plants: This category includes grasses, forbs, sedges, ferns, and rushes that are from 2' to 4' tall. The cool-season grasses are typically green in the winter, extending the growing season. Certain plants can tolerate some shade.

**Table 1-16
Medium Herbaceous Plants**

This table includes grasses, sedges, rushes, ferns and forbs that are from 2' to 4' at maturity

Botanical Name	Common Name	Sed	Filt
Carex emoryi	Emory's sedge	x	
Capsicum annuum	Chili pequin	x	x
Chasmanthium latifolium	Inland sea oats	x	x

Eleocharis quadrangulata	Squarestem spikerush	X	
Elymus canadensis	Canada wildrye	X	X
Elymus virginicus	Virginia wildrye	X	X
Equisetum hyemale	Horsetail	X	
Justicia americana	American Water-willow	X	
Leptochloa dubia	Green sprangletop		X
Liatris pycnostachya	Prairie blazing star	X	
Lobelia cardinalis	Cardinal flower	X	
Muhlenbergia capillaris	Gulf coast muhly	X	X
Muhlenbergia filipes	Purple muhly	X	X
Muhlenbergia rigens	Deer muhly		X
Physostegia spp.	Obedient plant	X	
Pluchea odorata	Marsh fleabane	X	X
Solidago altissima	Tall goldenrod	X	X
Sporobolus airoides	Alkali sacaton		X
Sporobolus virginicus	Seashore dropseed	X	X
Symphotrichum praealtum	Tall aster	X	X
Teucrium canadense	Canada germander	X	
Thelypteris ovata	Shield fern	X	

Short Herbaceous Plants: This category includes grasses, forbs, sedges, ferns, and rushes that are shorter than 2' at maturity. Certain plants are shade tolerant. Many will colonize an area by way of rhizomes, stolons or seed. The colonizers include sod-forming grasses that may be managed as turf. Mowing/trimming restrictions will apply to these areas. Other colonizers form attractive groundcovers and may serve as "fillers" in a garden.

Table 1-17
Short Herbaceous Plants

This table includes grasses, sedges, rushes and forbs that are usually shorter than 2' at maturity

Botanical Name	Common Name	Sed	Filt
Agrostis stolonifera	Creeping bentgrass	X	
Buchloe dactyloides	Buffalo grass	X	X
Calyptracarpus vialis	Horseherb		X
Carex cherokeensis	Cherokee sedge	X	
Conoclinium coelestinum	Blue mistflower	X	

<i>Distichlis spicata</i>	Salt grass	X	X
<i>Eleocharis palustris</i>	Common spikerush	X	
<i>Helianthus angustifolius</i>	Swamp sunflower		X
<i>Juncus tenuis</i>	Slender rush	X	
<i>Leersia hexandra</i>	Clubhead cutgrass	X	
<i>Marsilea macropoda</i>	Water clover	X	
<i>Muhlenbergia utilis</i>	Aparejogress	X	X
<i>Panicum obtusum</i>	Vine mesquite	X	X
<i>Paspalum distichum</i>	Knotgrass	X	
<i>Paspalum vaginatum</i>	Seashore paspalum	X	
<i>Penstemon tenuis</i>	Brazos penstemon	X	
<i>Phyla nodiflora</i>	Frogfruit	X	X
<i>Poa arachnifera</i>	Texas bluegrass	X	
<i>Rivina humilis</i>	Pigeonberry		X
<i>Rudbeckia hirta</i>	Black-eyed Susan		X
<i>Salvia penstemonoides</i>	Big red sage	X	
<i>Setaria parviflora</i>	Knotroot bristlegrass	X	X
<i>Solidago nemoralis</i>	Gray goldenrod		X
<i>Stenotaphrum secundatum</i>	St. Augustine grass	X	X
<i>Viola missouriensis</i>	Missouri violet	X	X

Optional Plants: Designer's Choice.

Plants in this category are counted towards the minimum quantity requirements (See item 1.6.7 (C) 5). While native grasses dominate the plant lists, many designers will want to use non-native ornamental grasses and plants. Ornamental grasses are used chiefly for ornament; however the plants in biofiltration have a greater purpose. The following restrictions apply:

- Plant types must conform to the requirements explained in the opening paragraph of Section 5 – Landscape Design.
- Plant species may not include plants that are considered invasive (refer to the Grow Green Native and Adapted Plant Guide – published by the City of Austin).
- Plant species may not include plants listed in Table 1-18 (Plants That Are Not Permitted).

Plants That Are Not Permitted.

Plants listed in Table 1-18 are not permitted in biofiltration systems. These plants are not native, yet have shown the capacity to naturalize here or in other areas of the country. The intent is to avoid future problems with invasive plants. The following restrictions apply:

- Plant species listed as invasive by the state of Texas are not allowed. Two lists are maintained.
- Refer to http://www.texasinvasives.org/Invasives_Database/Invasives.html
 - TDA Noxious Weed List
 - TPWD Prohibited Exotic Species
 - USDA NRCS – Texas, State-listed noxious weeds
<http://plants.usda.gov/java/noxious?rptType=State&statefips=48>

**Table 1-18
Plants That Are Not Permitted**

Botanical Name	Common Name	Comments
<i>Arundo donax</i>	Giant reed	Tall invasive grass
<i>Bothriochloa ischaemum</i> var. <i>songarica</i>	'King Ranch' bluestem (KR bluestem)	Invasive grass
<i>Cortaderia selloana</i>	Pampas grass	Potentially invasive
<i>Cytisus scoparius</i>	Scotch broom	Invasive shrub
<i>Eragrostis curvula</i>	Weeping love grass	Invasive grass
<i>Imperata cylindrica</i>	Cogon grass	Invasive grass
<i>Miscanthus sinensis</i>	Japanese silver grass	Invasive grass
<i>Pennisetum setaceum</i>	Fountain grass	Invasive grass
<i>Phragmites australis</i>	Common reed	Tall invasive grass
<i>Sapium sebiferum</i>	Chinese tallow	Invasive tree

Performance Requirements.

A minimum of 95% of the vegetation shall be alive and viable for one year following installation. No bare areas greater than 1 square foot may exist. These performance requirements apply to the entire pond including the pond bottom, side slopes, and areas adjacent to the pond.

Landscape Maintenance.

A lack of maintenance considerations in the design of a landscape commonly results in a site that is more maintenance intensive (i.e., costly) than necessary and/or appropriate for its purpose, and one that requires the routine use of practices that are undesirable (e.g.,

extensive pesticide use, intensive pruning of plants that grow too large for the spaces they occupy). It is important that the designer include maintenance considerations and IPM throughout the planning and design phase of a biofiltration project. To the extent possible, these criteria are designed to minimize the potential for pests and the amount of maintenance required for the biofiltration pond. Landscapes should be designed to allow for the access and aid the maneuverability of maintenance equipment (e.g., if areas of the pond are designed to be mown, acute angles should be avoided in turf areas; wide angles, gentle, sweeping curves, and straight lines are easier to mow).

A. Mowing and/or Trimming.

Mowing and/or trimming of vegetation is allowable with certain restrictions.

1. Tall Herbaceous and Medium Herbaceous Plants

Trimming activities must not impinge on the growing tips (basal crown) of the bunchgrasses. Cutting these grasses below the basal crown will severely stress and possibly kill them. These plants shall be cut no lower than 2' from the ground. The annual physical removal of all woody weeds from the filtration basin is required.

2. Short Herbaceous Plants

Sod-forming grasses may be mown or trimmed to an appropriate height. These plants shall not be scalped; cut no lower than 5" from the ground.

B. Integrated Pest Management (IPM).

An integrated pest management (IPM) plan and associated restrictive covenant is required for a biofiltration pond. IPM is a continuous system of controlling pests (weeds, diseases, insects or others) in which pests are identified, action thresholds are considered, all possible control options are evaluated and selected control(s) are implemented. Control options--which include biological, cultural, manual, mechanical and chemical methods--are used to prevent or remedy unacceptable pest activity or damage. Choice of control option(s) is based on effectiveness, environmental impact, site characteristics, worker/public health and safety, and economics. The goal of an IPM system is to manage pests and the environment to balance benefits of control, costs, public health and environmental quality. IPM takes advantage of all appropriate pest management options.

1. Weed Management

Preventing the introduction of weeds is the most practical and cost-effective method for their management. Do not allow bare soil to be present, design it out of the system. Prevention programs include such techniques as limiting weed seed dispersal, minimizing soil disturbance, and properly managing desirable vegetation. Remove weeds early in their growth stage, before they set seed. (One year of seeds is equal to seven years of weeds) Allow the desired vegetation to out-compete the weeds.

(a) Mulch: Control weeds by blocking light and air space.

- (i) Bark mulch, the traditional material for minimizing weeds in ornamental landscapes, is not recommended because it will tend to float or otherwise be washed out of the system. The innovative use of non-traditional mulches will be required when ornamental beds are used in biofiltration facilities. Gravel is permitted as mulch both in the sediment basin and the filter basin.
 - (ii) Gravel or crushed recycled glass equivalent in size to gravel may be used as mulch in biofiltration.
 - (iii) Weed fabric is not permitted in biofiltration due to the potential for clogging of the pores.
- (b). Cultivation: Cultivating cuts the weed roots below the soil to reduce root carbohydrates. May be done by hand tools only; using cultivating machines is not acceptable. Repeat cultivation at 2 – 3 week intervals during the growing season. Keep hoes sharp and in good condition to reduce the effort needed. Any bare areas must be re-seeded.
- (c). Organic herbicides: Be aware that organic herbicides must be used with caution and can be dangerous in concentrated form. Personal protective equipment must be used: rubber gloves, long pants, eye protection. The use of organic herbicides is restricted to the following products:
- (i). Acetic acid (20% vinegar) is effective on small annuals.
 - (ii). Essential oils: Includes cinnamon, clove, summer savory and thyme. must be used at the appropriate concentration. Effective on a limited number of species.

2. Mosquito Management

Biofiltration ponds shall not become breeding places for mosquitoes. Meet the drainage requirements established per 1.6.7 (C). Once the pond has drained, remaining incidental standing water must not be present for longer than three days (72 hours) thereafter.

3. Wildlife and Pet Management

In addition to water quality treatment, biofiltration ponds offer additional benefits such as providing food and habitat for wildlife. Pets may also be attracted to them. However, activities by animals within a pond shall not interfere with pond functions and design objectives. Digging or burrowing by animals in the filtration basin is particularly troublesome. There is the potential for certain animals to become a pest of biofiltration ponds in the Austin area. Evaluate the potential for problems due to animal activity in the proposed pond site. Where the potential

exists for problematic activity, fencing or similar exclusionary method shall be provided.

6. Irrigation. Irrigation will be necessary to establish the vegetative community during the first 3-6 months after planting. Thereafter irrigation needs should be minimal and a permanent irrigation system may not be necessary. If a permanent irrigation system is proposed, the design must address both stormwater management and plant health needs. In particular, overwatering is unacceptable as it will negatively impact the hydraulic performance and pollutant removal capabilities of the biofiltration system. The following minimum criteria will apply for permanent irrigation systems:

Soil water moisture sensors must be installed at appropriate depths and locations in the biofiltration basin.

No irrigation during periods when rainfall is occurring.

No irrigation is to commence until the soil moisture content of the filtration media is $\leq 25\%$ of the Available Water Capacity (AWC). For plants native or adapted to arid and semi-arid conditions, no irrigation should commence until the soil moisture content is \leq Wilting Point (WP), or 0% AWC.

Irrigation will cease once the soil moisture content is $\leq 75\%$ AWC; 50% for plants native or adapted to arid and semi-arid conditions.

It is required that the irrigation designer conduct a water balance to aid in the design, using a time step of one day or less.

7. Maintenance. Once vegetation is established, biofiltration systems should require less maintenance than sand filtration systems because the vegetation protects the filtration media from surface crusting and sediment clogging. Plant roots also provide a pathway for water to permeate down into the media, thus further enhancing the hydraulic performance of the system. Unless damaged by unusual sediment loads, high flows, or vandalism, the biofiltration media should be left undisturbed and allowed to age naturally.

Water Plants as necessary during the first growing season and during dry periods. Irrigation will be necessary to establish the vegetative community during the first 3-6 months after planting has been completed and by hand immediately after completion of the project.

Biweekly inspection of vegetation during first growing season until 95% vegetative cover is established.

Monthly Check for accumulated sediments, remove as needed.

Quarterly removal of debris, sediment accumulation, and soil media should be replaced in void areas caused by settlement, and repair eroded areas. Remulch any void areas by hand whenever needed.

Six months remove and replace dead and diseased vegetation. Removal and replacement of all dead and diseased vegetation considered beyond treatment (See planting specifications).

Treat all diseased trees and shrubs mechanically or by hand depends on insect or disease infestation.

Late Winter harvesting involving trimming of bunchgrasses (trim to minimum 18" or higher, see specific trimming recommendations), and mowing of turf grasses (minimum 5" high). For other types vegetation see recommendations in the planting specifications.

Spring remove previous mulch layer before applying new layer (optional) by hand once every two to three years in the Spring.

Any time 48 hour drawdown time is exceeded or significant decrease in drawdown time is observed evaluate bed soil, underdrain system and appropriate measures should be taken. Biofiltration pond vegetation shall be managed so that a dense, healthy vegetative cover is preserved. Once established, native grasses shall be maintained without fertilizers and limited use of organic herbicides. A recorded restrictive covenant and cover sheet notes will establish the requirements for the implementation and on-going maintenance of an approved Integrated Pest Management Plan (IPM).

8. Signage. Delineate the boundaries of the biofiltration area as minimal mow maintenance, no fertilizers, and limited use of organic herbicides application is allowed.
9. Sequence of Construction. The following sequence of construction shall be used for all development using the biofiltration design criteria. The applicant is encouraged to provide any Additional details appropriate for the particular development.
 1. Erosion controls and tree protection are to be installed as indicated on the approved site plan.
 2. Contact the Watershed Protection and Development Review Department to schedule a preconstruction coordination meeting to be held on site.
 3. Erosion controls will be revised, if needed, to comply with Inspectors' directives, and revised construction schedule relative to the water quality plan requirements and the erosion plan.
 4. Rough-cut all required or necessary ponds. Either the permanent outlet structure or a temporary outlet must be constructed prior to development of any embankment or excavation that leads to ponding conditions. The outlet system must consist of a low-level outlet and an emergency overflow meeting the requirements of the Drainage Criteria Manual (Section 8.3) and/or the Environmental Criteria Manual (section 1.4.2.K) as required. The outlet system

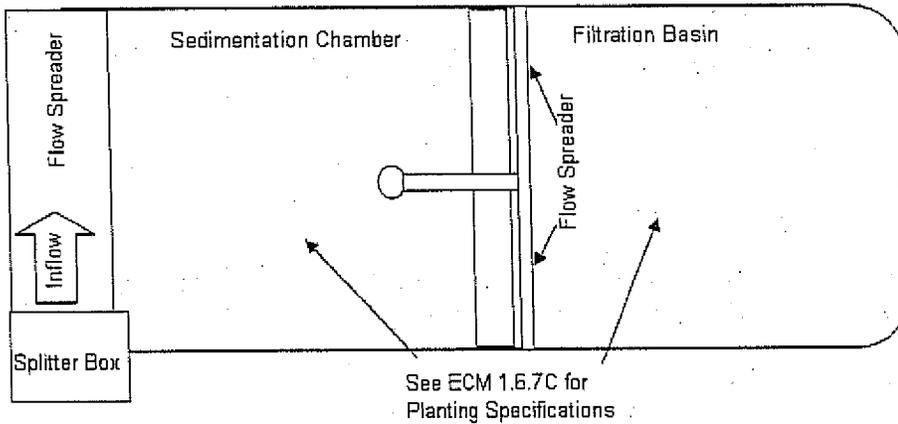
shall be protected from erosion and shall be maintained throughout the course of construction until final restoration is achieved.

5. Temporary controls to be inspected and maintained weekly and prior to anticipated rainfall events, and after rainfall events, as needed.
6. Schedule a mid-construction conference with the City Inspector to coordinate changes in the construction schedule and evaluate effectiveness of the erosion control plan after possible construction alterations to the site.
7. Complete construction and stabilize all areas draining to the biofiltration basin. Permanent controls will be cleaned out and filter media will be installed after stabilization of the site.
8. Complete permanent erosion control and site restoration. Remove temporary erosion/sedimentation controls and tree protection. Restore any areas disturbed during removal of erosion/sedimentation controls.
9. Provide plant material tags for the vegetation and soil media test analysis report to the Environmental Inspector prior to planting followed by the Engineer's concurrence letter.

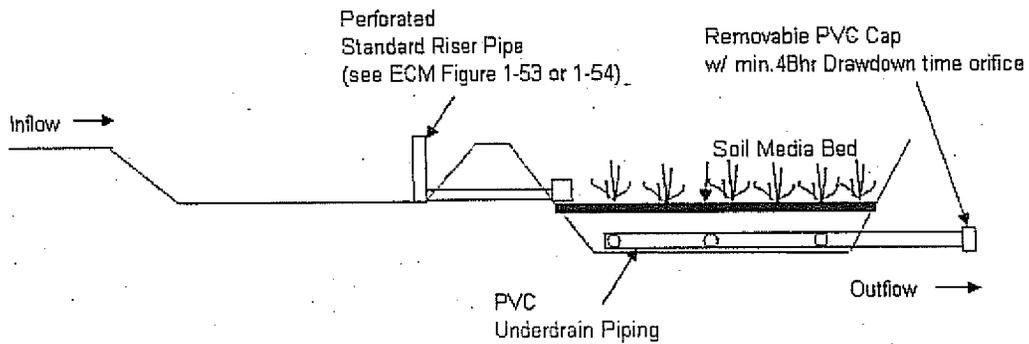
References:

1. Maryland Department of the Environment, Center for Watershed Protection, 2000, *2000 Maryland Stormwater Design Manual, Volumes I and II*
2. New Jersey Department of Environmental Protection, 2004, *Stormwater Best Management Practices Manual*, Division of Watershed Management Trenton, NJ.
3. Prince George's County Department of Environmental Resources Programs and Planning Division, 2001, *The Bioretention Manual*, Maryland
4. Low Impact Development (LID), Urban Design Tools, lid-stormwater.net
5. USEPA, NPDES, Stormwater Best Management Practices, cfpub.epa.gov/npdes/stormwater/

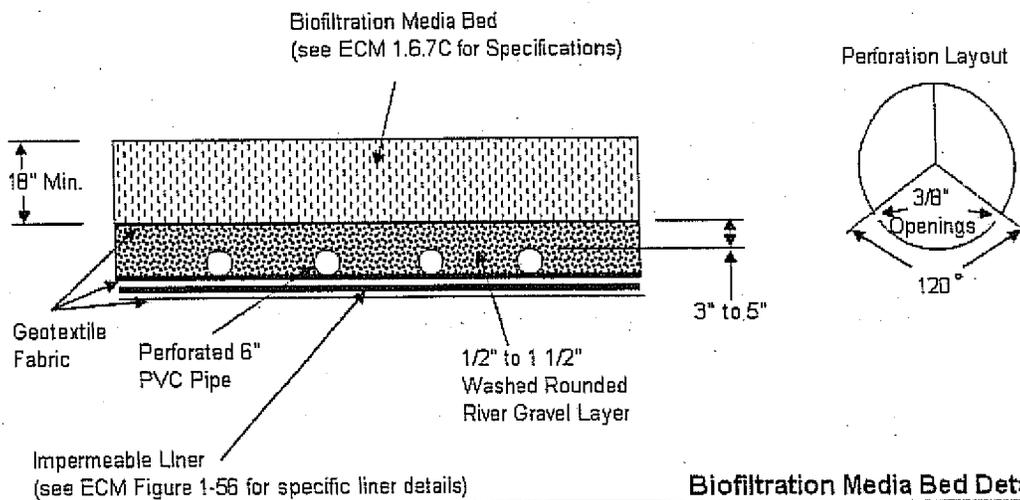
Figure 1A: Full Sedimentation / Biofiltration Pond



Plan View

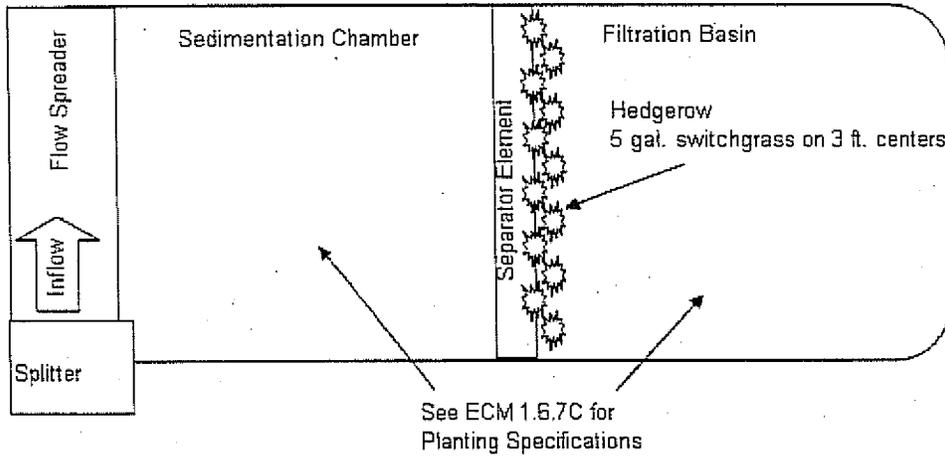


Profile

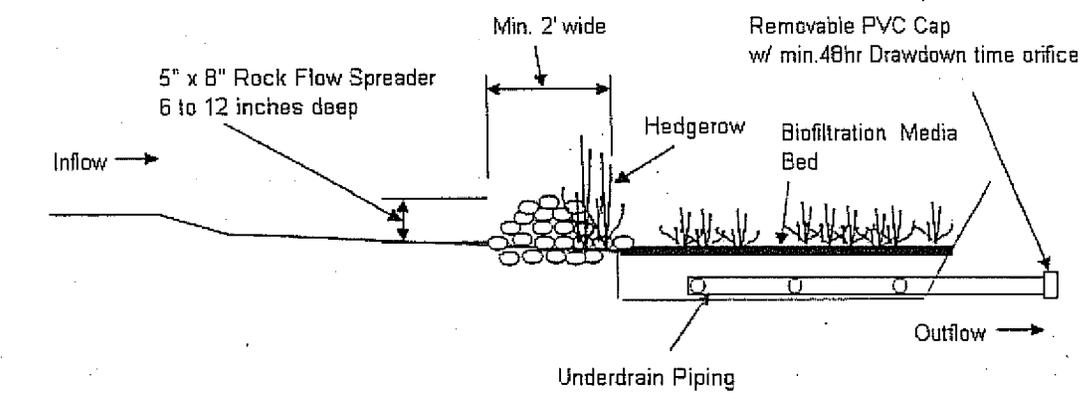


Biofiltration Media Bed Detail

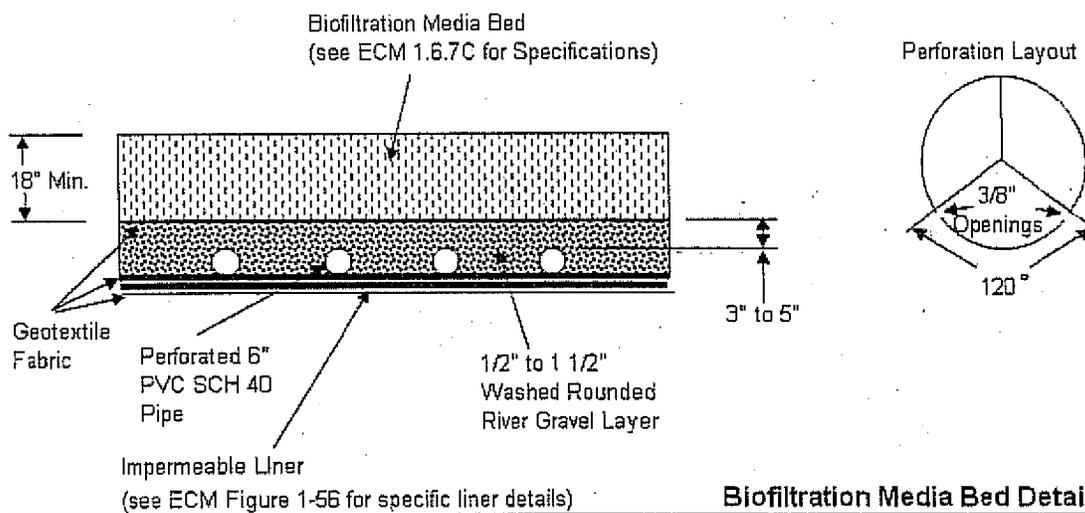
Figure 1B: Partial Sedimentation / Biofiltration Pond



Plan View



Profile



Biofiltration Media Bed Detail

D. Rainwater Harvesting

1. Introduction. Rooftops can generate large volumes of runoff which, when discharged to paved surfaces and landscaped areas, can generate large pollutant loads. Rainwater harvesting systems can capture this runoff before it is discharged, thus preventing pollution while also putting the captured water to beneficial use, such as landscape irrigation or cooling water. The amount of runoff captured will depend on the size (water quality volume) and drawdown time of the rainwater harvesting system. The systems can also control the peak flow rate for the 2-year, 3-hour rainfall event see section 1.6.8 of the Environmental Criteria Manual (ECM) if specifically designed for this purpose. Rainwater harvesting systems can provide equivalent treatment to a standard sedimentation/filtration system but only the irrigation design (Option B) described below will meet retention irrigation system standards and therefore can be used as a primary method for controlling non-point source pollution in watersheds within the Barton Springs Zone or Barton Springs Contributing Zone. Rainwater Harvesting systems will only be permitted for commercial developments.

In an effort to promote water conservation, the State of Texas offers financial incentives and tax exemptions to offset the equipment costs. Additionally, the Water Conservation staff of the City of Austin Water Utility Department is available to provide input on how to achieve cost efficient design and equipment selection that will also help reduce water and wastewater costs.

2. Water Quality Credit.

The water quality credit will typically be applied as either a reduction in the water quality volume for a structural control or a reduction in the fee-in-lieu cost. The basic credit equation is:

$$WQC = IAF * BMPDF$$

- WQC = Water Quality Credit, a value between 0 and 1, with 1 meaning 100% credit.
- Where IAF is the Impervious Area Factor, or the ratio of the impervious area treated by the control to the total site impervious area.
- BMPDF is the BMP Design Factor, a value between 0 and 1, is a measure of the potential effectiveness of the control.

For rainwater harvesting systems the BMPDF variable will be calculated as:

$$BMPDF = (WQV_{rwh}/WQV_{ecm}) * (DDT_{ecm}/DDT_{rwh})$$

- WQV_{rwh} is the water quality capture depth provided by the rainwater harvesting system in inches.
- WQV_{ecm} is the ECM required water quality capture depth in inches.

- DDT_{ecm} is the ECM required drawdown time for sedimentation-filtration system in hours (48 hrs.).
- DDT_{rwh} is the rainwater harvesting system drawdown time in hours (a maximum of 72 hrs.).

It is assumed that the rainwater harvesting system will be capturing runoff from rooftops that are 100% impervious cover. The water quality capture depth for 100% impervious cover is 1.30-inch for projects located outside of the Barton Springs Zone. The drawdown time for equivalency, based on sedimentation-filtration systems, is 48 hours. Inserting these values into the BMPDF equation, with rounding, gives:

$$BMPDF = 37 * WQV_{rwh} / DDT_{rwh}$$

- Where WQV_{rwh} is in inches
- DDT_{rwh} is in hours

The derivation of the drawdown time will vary with the type of system, as described below for specific design options. In all cases the drawdown is calculated as:

$$DDT = WQV / Q_{rwh}$$

- Where DDT is the drawdown time
- WQV is the water quality volume
- Q_{rwh} is the rate of discharge from the rainwater harvesting system

A. Design Options: : Rainwater harvesting with Infiltration or Irrigation of a Vegetated Area in ≤ 72 hours

In this design, the captured runoff is held in the rainwater harvesting system for at least 12 hours after rainfall has ceased, then either gravity-drained to a vegetated area sized large enough to infiltrate all the water (Option A), or used to irrigate the vegetated area (Option B). The latter design is similar to a retention/irrigation system and ECM section 1.6.7(A) should be referenced for guidance. The vegetated area can also serve as a vegetated filter strip for flows that by-pass the rainwater harvesting system.

Because the required drawdown time is no more than three (3) days, these systems generally cannot be used to meet water conservation-oriented landscape irrigation needs (e.g., 5-day watering schedule).

Option A - Captured Runoff Gravity-Drained to a Vegetated Area for Infiltration

The water quality volume must be provided by the system designer, with the drawdown time set to 72 hours. The designer must demonstrate that the vegetated area is sufficiently large to infiltrate the entire water quality volume within 72 hours (see Figure 1A). In lieu of a detailed analysis the procedure described below can be used.

The average "treatment" rate of the rainwater harvesting system is:

$$Q_{avg} = WQV/DDT$$

- Where Q_{avg} is the treatment rate
- WQV is the water quality volume
- DDT is the drawdown time, which is set to 72 hours

It is reasonable to assume saturated conditions, and the infiltration rate of the vegetated area can be calculated as:

$$Q_{veg} = k * i * A$$

- Where k is the soil hydraulic conductivity
- i is the hydraulic gradient
- A is the infiltration (vegetated) area

As minimal ponding of water over the vegetated area is expected, the hydraulic gradient can be assumed equal to 1, thus:

$$Q_{veg} = k * A$$

To be conservative, design the vegetated area for the maximum flowrate discharged from the rainwater harvesting system. A reasonable assumption is to assume a value twice Q_{avg} , and to also assume a lag time (LT) between the time runoff ends and when the rainwater harvesting system begins discharging:

$$Q_p = (2 * WQV)/(DDT - LT)$$

Setting the peak flow rate discharged from the rainwater harvesting system (Q_p) equal to the vegetated area infiltration rate (Q_{veg}), and solving for A :

$$A = (2 * WQV)/(k * (DDT - LT))$$

A low hydraulic conductivity value that is typical of Austin area soils should be used, and 0.06 in/hour, or 0.005 ft/hour, is assumed. The lag time LT should be set to 12 hours. Inserting these assumptions into the infiltration (vegetated) area gives:

$$A = (400 * WQV)/(DDT - 12)$$

- Where A is the minimum required infiltration (vegetated) area in ft^2
- WQV is the water quality volume in ft^3
- DDT is the drawdown time in hours
- 12 is the lag time (LT) in hours

Assuming a 72 hour drawdown time the equation becomes:

$$A = 6.67 * WQV$$

- Where A is the minimum required infiltration (vegetated) area in ft²
- WQV is the water quality volume in ft³

A larger area will be needed for drawdown times less than 72 hours. A drawdown time greater than 72 hours is not allowed.

To be eligible for water quality credit the vegetated area must meet the vegetated filter strip criteria in ECM 1.6.7(B) or 1.6.7(F), with the following additions:

- The length (dimension in direction of flow) of the vegetative area should be at least 15 feet
- The hydraulic loading rate should not exceed 0.05 cfs per ft. width for the maximum flowrate applied to the filter strip (see below for procedure to calculate peak flowrate). Higher hydraulic loading rates are allowed but will reduce water quality credit. In this case, a maximum allowable rate of 0.15 cfs per ft. width is allowed.
- The soil depth should be a minimum of eight (8) inches
- An irrigation plan is required.

Option B – Captured Runoff Used to Irrigate Vegetated Area

The water quality volume must be provided by the system designer, with the drawdown time set to 72 hours. The system should be designed according to the retention/irrigation criteria in section 1.6.7 of the Environmental Criteria Manual should be used (see Figure 1B).

Example – Captured runoff gravity-drained to vegetated area (Option A)

A 5 acre commercial development with 80% impervious cover (4 impervious acres) is proposing a rainwater harvesting system that would capture runoff from 2 acres of rooftop. The system would have a water quality volume of 25,000 gallons, which would be emptied in 72 hours by discharging to a vegetated area that is 260' wide by 90' long. Evaluate this design and determine the water quality credit it may be eligible for.

The water quality credit will typically be applied as either a reduction in the water quality volume for of a structural control or a reduction in the fee-in-lieu cost.

As the alternative control is for 2 acres of impervious cover, and the site has a total of 4 impervious acres, the IAF value is 0.50 (= 2/4).

- The BMPDF factor is a function of two components, the rainwater harvesting system and the vegetated area. The BMPDF value for the rainwater harvesting system is based

on the water quality volume and drawdown time, subject to the requirement that the vegetated area must be large enough to infiltrate the captured volume.

To determine the BMPDF value, first convert the water quality volume from gallons to inches:

$$WQV = (25,000 \text{ gallons} * 1 \text{ ft}^3/7.481 \text{ gal}) = 3,342 \text{ ft}^3 = 0.460\text{-inch}$$

The BMPDF value is calculated as:

$$BMPDF = 37 * WQV/DDT$$

- Where WQV is in inches
- DDT is in hours

$$\text{Or BMPDF} = 37 * 0.46/72 = 0.236$$

Before this credit can be applied first determine if the vegetated area is sufficient to infiltrate the water quality volume in 72 hours.

Is it large enough?

$$\text{Minimum size } A = 6.67 * WQV = 6.67 * 3,342 = 22,290 \text{ ft}^2$$
$$\text{Size provided} = 260' * 90' = 23,400 \text{ ft}^2 - \text{just large enough}$$

Is the length of the vegetated area at least 15 feet?

Yes as the proposed length is 90 feet.

Does it meet the 0.05 cfs/ft. width hydraulic loading rate for the discharge from the rainwater harvesting system?

To estimate peak flowrate and hydraulic loading rate:

$$Q_p = (2 * WQV)/(DDT - LT) = (2 * 3,342)/(72 - 12) = 111 \text{ cfh} = 0.031 \text{ cfs}$$

$$HLR = Q/W = 0.031/260 = 0.00012 \text{ cfs/ft width} - \text{Okay as } < 0.05$$

All other slope, soil depth, vegetative cover, etc. criteria is also met, thus the vegetated area is acceptable and:

The total water quality credit for the proposed system is:

$$WQC = IAF * BMPDF = 0.5 * 0.235 = 0.118$$

Thus the rainwater harvesting system reduces by 11.8% the required water quality volume or fee-in-lieu cost.

Maintenance. Proper monitoring and maintenance is important for any system to work appropriately and efficiently. Each configuration will perform differently. After the system has stabilized, inspection and maintenance might be needed several times a year and/or after heavy rainfall events. A pretreatment filter system (i.e., leaf guards, strainers, roof washers, etc.) will be required prior to the cistern. An approved Integrated Pest Management Plan (IPM) with a recorded restrictive covenant will be required for all drainage areas to the control and irrigation areas.

Post Construction:

- The control and repair of erosion rills, from the irrigation system, should take place after each rainfall event until the vegetation is well established.
- Adjustments to the irrigation area should be considered as the vegetation matures and/or to minimize erosion problem areas.

Quarterly or after each rain event:

- Inspect water tanks periodically to insure proper functioning. Screen inlet and outlet pipes to keep the system closed to mosquitoes. Cap and lock tanks for safety.
- Caps should have access ports for interior inspection and maintenance.
- Clean pretreatment filter system, gutters, inflow, and outflow pipes as needed; sediment, trash, leaves, or other debris should not be allowed to accumulate to a point where it impedes the proper function of the rainwater harvesting system.
- Irrigation systems should be cleaned and damage sprinkler heads replaced.

References:

1. The Texas Manual on Rainwater Harvesting, 3rd edition 2005
2. City of Tucson Water Harvesting Guidance Manual, October 2005
3. City of Austin Energy, Green Building Program, 1995

Figure 1A: Rainwater Harvesting: Option A

Captured Runoff discharged to a Vegetative Filter Strip for Infiltration (< 72 hr drawdown time)

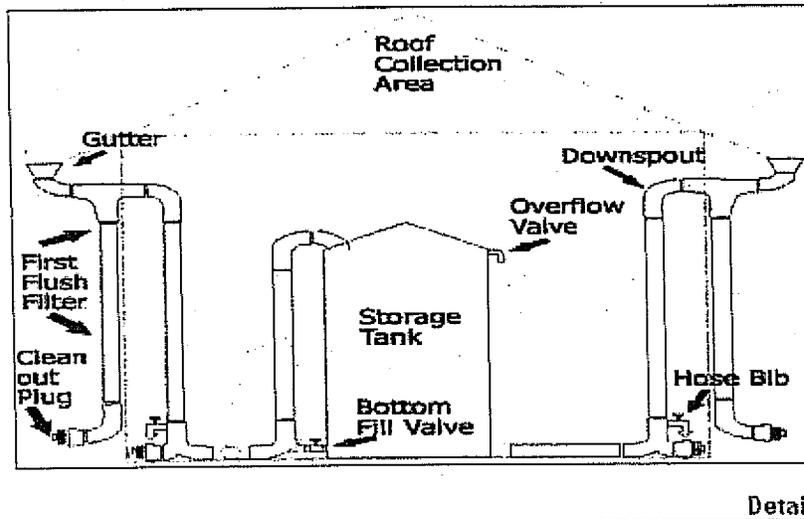
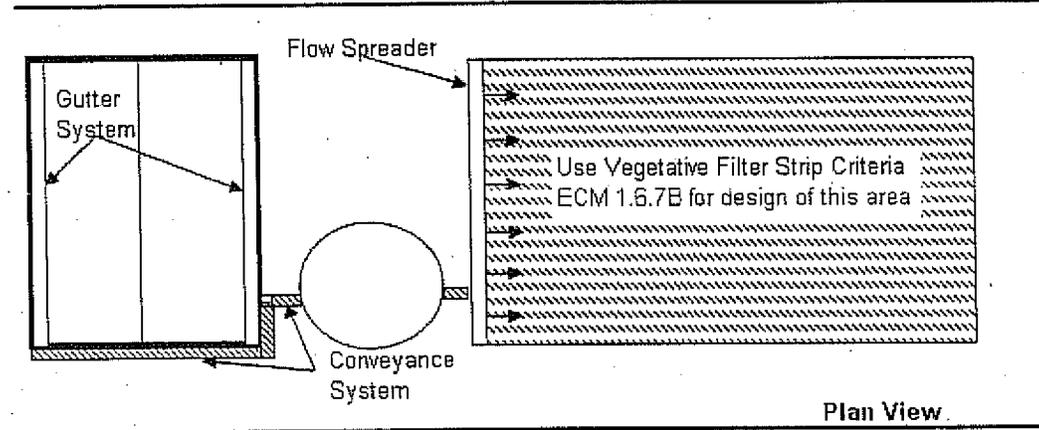
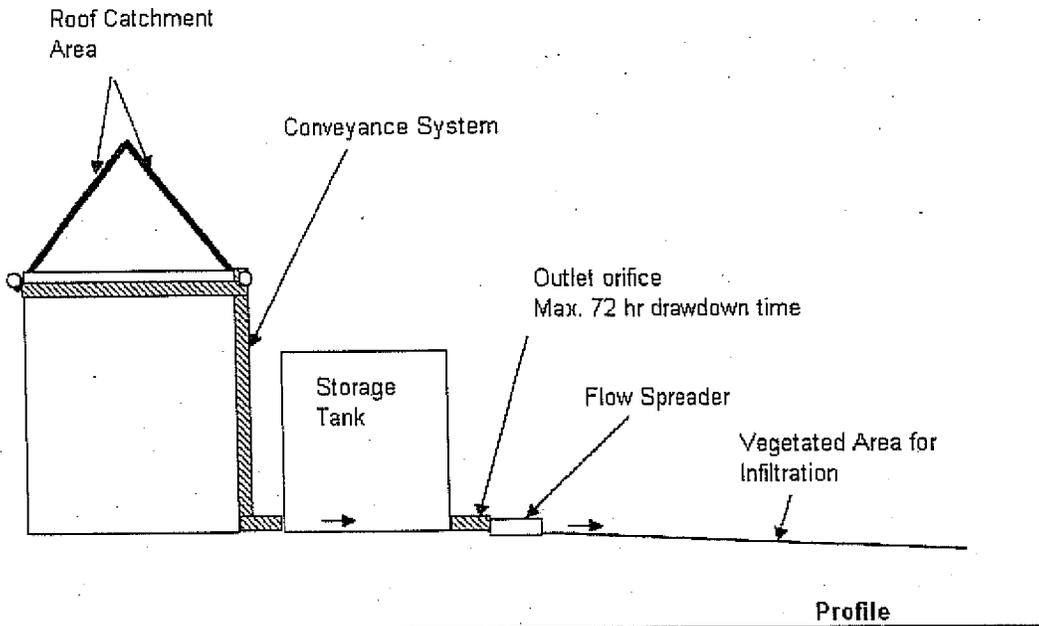
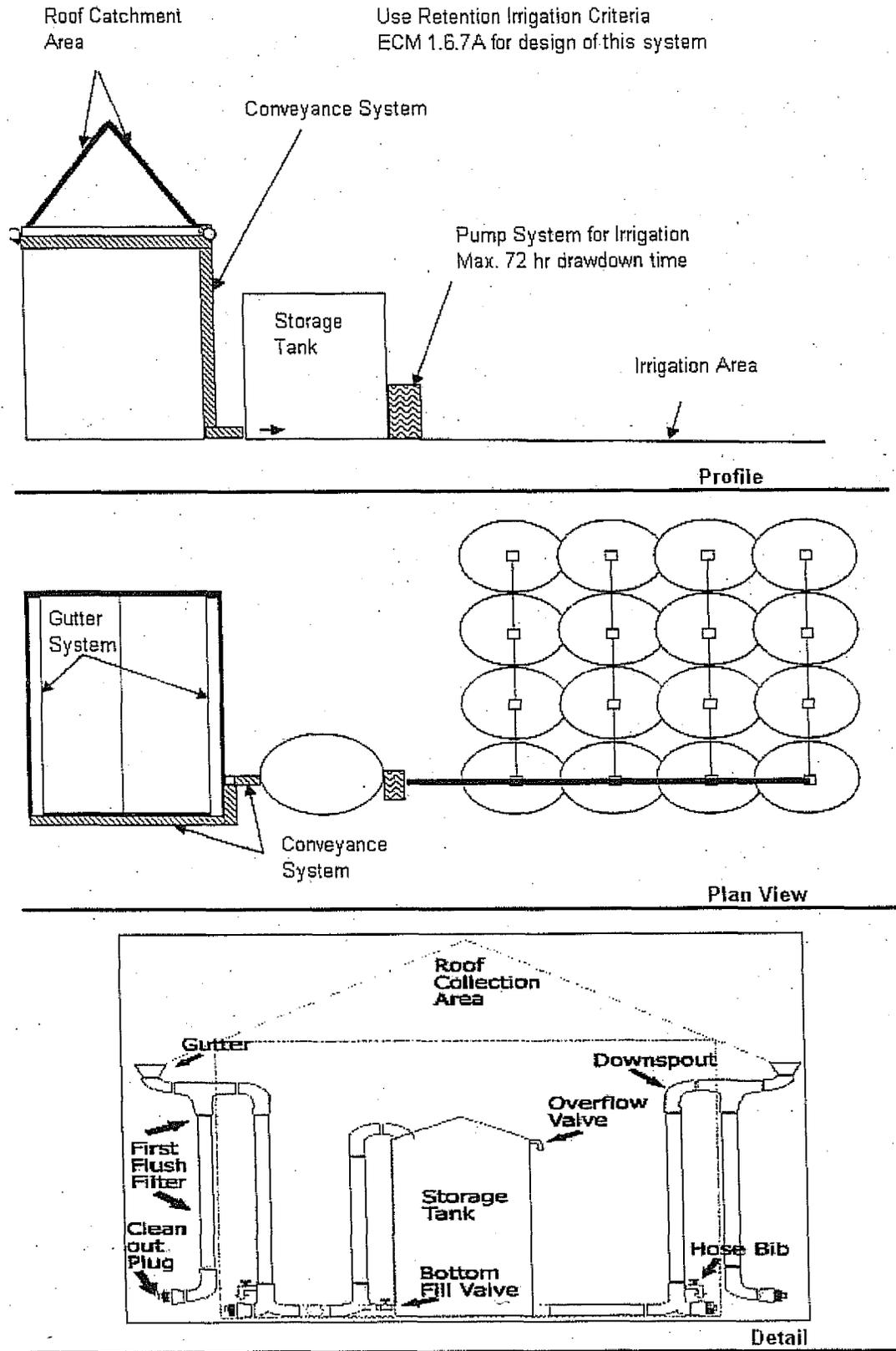


Figure 1B: Rainwater Harvesting: Option B

Captured Runoff Used to Irrigate Vegetated Area (<72 hr drawdown time)



E. Porous Pavement for Pedestrian Use

1. Introduction. Porous Pavement describes a system comprising a load-bearing, durable concrete surface together with an underlying layered structure that temporarily stores water prior to infiltration. Porous Pavement is a water quality control best management practice (BMP) using the storage within the underlying structure or sub-base to provide ground water recharge and to reduce pollutants in stormwater runoff. Unlike traditional pavement, porous pavement contains little or no "fine" materials; instead, it contains voids that encourage infiltration. Porous pavement consists of an open-graded coarse aggregate, bonded together by asphalt cement, with sufficient interconnected voids to make it highly permeable to water. When proposing the use of this material be sure to provide highly detailed specifications and ensure that an experienced contractor is used to minimize potential problems.

Porous pavement is not allowed under stormwater hot spots or areas where land use or activities generate highly contaminated runoff. Hot spot runoff frequently contains pollutant concentrations exceeding those typically found in stormwater. Hot spots include commercial nurseries, auto recycle facilities, drive through service facilities, fueling stations, storage areas, industrial rooftops, marinas, outdoor container storage of liquids, outdoor loading and unloading facilities, public works storage areas, hazardous materials generators (if containers are exposed to rainfall), vehicle service and maintenance areas, and vehicle and equipment washing and steam cleaning facilities. Since porous pavement is an infiltration practice, it should not be applied at stormwater hot spots due to the potential for ground water contamination.

2. Water Quality Credit and Design Guidelines.

Porous pavement for pedestrian use can be counted as pervious area if the following criteria is met:

- Porous pavement thickness \geq 3 inches with ~~total~~ effective porosity \geq 0.30.
- COA walkways standard sidewalk dimensions used (i.e., no over-sized walkways that may encourage vehicular use).
- No off-site runoff
- No irrigation
- Depth to water table \geq 3 feet
- Depth to bedrock \geq 12"
- Industrial vacuuming or pressure washing every six months.
- See Figure 1A for general details.

Example 1

A 5 acre commercial site with 80% impervious cover (4 impervious acres) is required to implement on-site water quality controls. The development proposes to use 0.5 acres of

porous pavement for pedestrian walkways. Determine the water quality credit for this system.

Without the porous pavement, the water quality volume required is 1.10", or 19,965 ft³.

Assuming the above criteria is met, the porous pavement deducts 0.5-acre from the site impervious cover, thus the site behaves as if it is 4.5 acres with 3.5 impervious acres, or 77.8% impervious cover. This reduces the required water quality volume from 1.10" to 1.078" and the drainage area is also reduced from 5 acres to 4.5 acres. The required water quality volume with porous pavement is thus 17,605 ft³, or about a 12% reduction.

3. Construction.

Subgrade Preparation. Since porous pavement is an infiltration practice it is imperative that the permeability of the underlying native soils be preserved. It is important to protect the subgrade from over compaction, accumulation of fines, excessive construction equipment traffic, and surface ponding. No grading should take place during wet soil conditions to minimize sealing of the soil surface. In situations where the subgrade has been over compacted or the permeability has been diminished scarification should take place to a depth sufficient to match the naturally occurring in-situ state, typically scarification should be a minimum of three (3) to twelve (12) inches in depth. Any accumulation of debris, fines, or sediment that has occurred during subgrade preparation should be removed prior to starting the gravel bed installation.

Gravel Bed Preparation. Immediately upon completion of the subgrade preparation and after acceptance of the subgrade work by the Watershed Protection and Development Review inspector the placement of the one-half (0.5) to one and one-half (1.5) inch diameter washed, rounded, river gravel, can begin. Any accumulation of debris, fines, or sediment that has occurred during the placement of the gravel bed installation should be removed.

Porous Pavement Installation. Contractor installation qualifications require that the contractor provide to the Watershed Protection and Development Review Department inspector at the preliminary construction meeting a statement attesting to qualifications and demonstrating experience with the following porous pavement procedures and tests:

- A minimum of two (2) completed projects with addresses
- Measuring unit weight acceptance data
- Conducting in-situ pavement tests including void content and unit weight
- Preparing product samples

If the installing contractor and pavement producer do not have sufficient experience with porous pavement systems, the installing contractor shall retain an experienced consultant to monitor production, handling, and placement operations at the contractor's expense.

4. Maintenance.

Construction and Post construction:

- Do not seal or repave with non-porous materials.
- No piling of dirt, sand, gravel, or landscape material without covering the pavement first with a durable cover to protect the integrity of the pervious surface.
- All landscape cover must be graded to prevent washing and or floating of such materials onto or through the pervious surface. No off-site flows allowed onto the porous pavement area.
- All chemical spills inclusive but not limited to petrochemicals, hydrocarbons, pesticides, and herbicides should be reported to the owner so they can prevent uncontrolled migration. Chemical migration control may require flushing, and/or the introduction of microbiological organisms to neutralize any impacts to the soil or water.

Monthly:

Ensure that paving area is clean of debris, ensure that paving dewaterers between storms, and ensure that the area is clean of sediments.

Semi-annually:

The porous pavement should be protected from landscape clogging due to runoff from landscape areas, rooftops, and other areas that may significantly reduce the long-term permeability by diverting flows away. It is recommended that the pervious surface be power washed and surface vacuumed semi-annually in order to flush out silt or other contaminants that may reduce the long-term permeability. It is recommended that this frequency be increased for areas where overhanging vegetation, excessive dirt and pollutants are frequent.

Annually:

Inspect the surface for deterioration and repair and/or replace porous pavement as necessary.

5. Signage. Signs should be posted in landscape areas and/or at entrances to the property as reminders of an ecologically sensitive pavement structure and that certain guidelines must be adhered to.

6. Sequence of Construction. The following sequence of construction shall be used for all development using the porous pavement design-criteria. The applicant is encouraged to provide any Additional details appropriate for the particular development.

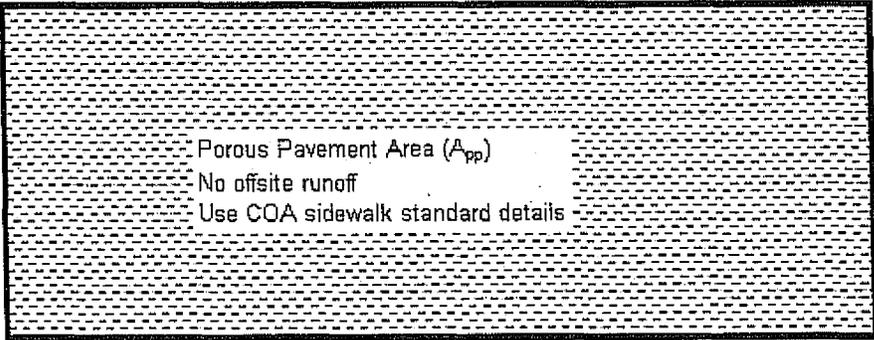
1. Erosion controls and tree protection are to be installed as indicated on the approved site plan.
2. Contact the Watershed Protection and Development Review Department to schedule a preconstruction coordination meeting to be held on site.
3. Contractor installation letter attesting to qualifications and demonstrating experience with porous pavement systems must be provided to the inspector at the preliminary construction meeting.

4. Erosion controls will be revised, if needed, to comply with Inspectors' directives, and revised construction schedule relative to the water quality plan requirements and the erosion plan.
5. Rough-cut all required or necessary ponds. Either the permanent outlet structure or a temporary outlet must be constructed prior to development of any embankment or excavation that leads to ponding conditions. The outlet system must consist of a low-level outlet and an emergency overflow meeting the requirements of the Drainage Criteria Manual (Section 8.3) and/or the Environmental Criteria Manual (section 1.4.2.K) as required. The outlet system shall be protected from erosion and shall be maintained throughout the course of construction until final restoration is achieved.
6. Temporary controls to be inspected and maintained weekly and prior to anticipated rainfall events, and after rainfall events, as needed.
7. Schedule a mid-construction conference with the City Inspector to coordinate changes in the construction schedule and evaluate effectiveness of the erosion control plan after possible construction alterations to the site.
8. Contact Watershed Protection and Development Review Department to schedule inspection of sub-grade prior to placement of the gravel bed and porous pavement installation. The removal of fines, scarification of over compacted subgrade bed, and restoration of the naturally occurring in-Situ state should occur prior to placement of the gravel bed and installation of the porous pavement. For Vehicular Use porous pavement provide documentation verifying that the hydraulic conductivity of at least three (3) feet of soil immediately beneath the subgrade is > 0.5 inch/hour prior to placement of the porous pavement.
9. Complete permanent erosion control and site restoration. Remove temporary erosion/sedimentation controls and tree protection. Restore any areas disturbed during removal of erosion/sedimentation controls.
10. Upon completion of the proposed site improvements the engineer shall provide an Engineer's concurrence letter certifying in writing that the proposed facilities were constructed in conformance with the approved plans.

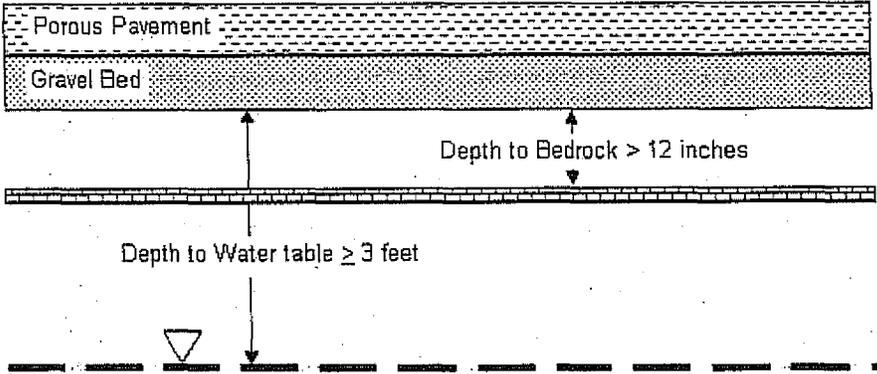
References:

1. USEPA, NPDES, Stormwater Best Management Practices, cfpub.epa.gov/npdes/stormwater/
2. Lower Colorado River Authority, Highland Lakes Watershed Ordinance, *Water Quality Management Technical Manual*, February 1, 2006

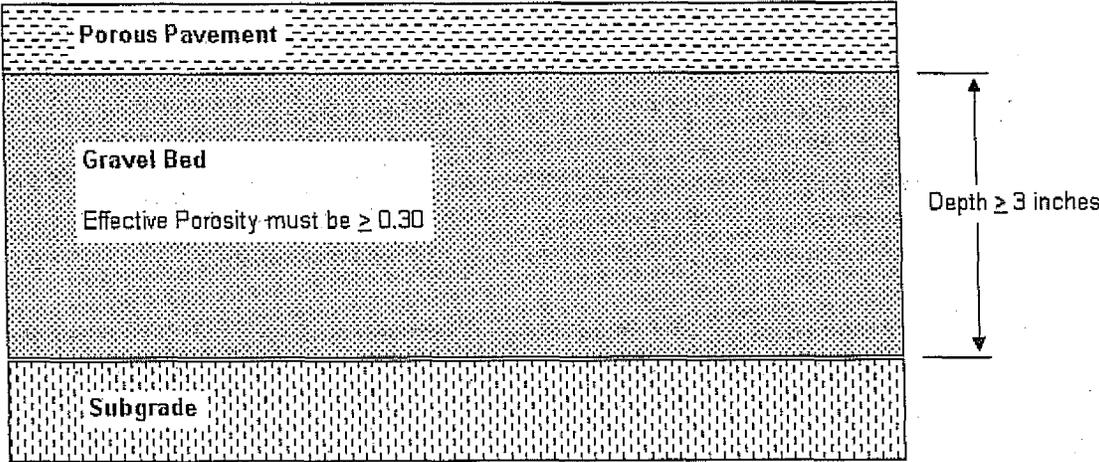
Figure 1A: Porous Pavement for Pedestrian Use Only



Plan View



Overall Profile



Cross Section Detail

F. Vegetative Filter Strip - Disconnection of Impervious Cover

1. Introduction. The disconnection of impervious cover and treatment of stormwater runoff by vegetative filter strips are considered a water quality control best management practice (BMP) by using the physical filtration properties of plants and infiltration properties of soils for removal of pollutants from stormwater runoff. The purpose of this section is to provide guidance on assigning partial water quality credit for vegetative filter strips smaller than those meeting the criteria provided in 1.6.7(B) of the Environmental Criteria Manual (ECM). All other design, operational, and maintenance criteria provided in ECM 1.6.7(B) must be met. It is imperative that stormwater flows from the impervious cover disconnection will not cause any increase in flooding conditions to the interior of existing building structures, including basement areas, for storms of magnitude up through the 100-year event or increased inundation of any building or roadway surfaces (Drainage Criteria Manual Section 1.2.2). Vegetative filter strips for treatment of disconnected impervious cover can provide partial treatment equivalent to a standard sedimentation/filtration system but are not acceptable as a primary method for controlling non-point source pollution in watersheds within the Barton Springs Zone and Contributing Barton Springs Zone. Throughout this section, the acronym VFS and the term filter strip are used when referring to vegetative filter strips.

2. General Design Guidelines. Filter strips must be sized correctly, have the proper slope, utilize sheet flow that does not exceed a maximum velocity, have appropriate soil type and thickness, and have appropriate vegetation of the proper density. The VFS shall not receive runoff until after the contributing drainage area has been stabilized to prevent erosion and sedimentation. Filter strips can be classified as either natural or engineered. In general, natural filter strips utilize existing vegetated areas whereas engineered filter strips are constructed features. Engineered vegetative filter strips differ from natural vegetative filters in that they are specifically designed and constructed to maximize the water quality benefits of this practice, particularly in areas where adequate buffers do not exist naturally or cannot be preserved. It should also be noted that vegetative filter strips cannot be used to provide detention of erosive flow (2-year control per ECM 1.6.8) or flood flows.

3. Water Quality Credit. A credit is given when impervious cover runoff is disconnected and then directed to a pervious area where it can filter over it. The credit is typically obtained by grading the site to promote overland flow of runoff to a vegetated area. For rooftop impervious cover disconnects the downspouts must be at least 10 feet away from the nearest impervious surface to discourage "re-connections".

The water quality credit will typically be applied as either a reduction in the water quality volume for of a structural control or a reduction in the fee-in-lieu cost. The basic credit equation is:

$$WQC = IAF * BMPDF$$

- WQC = Water Quality Credit, a value between 0 and 1, with 1 meaning 100% credit.
- Where IAF is the Impervious Area Factor, or the ratio of the impervious area treated by the control to the total site impervious area.
- BMPDF is the BMP Design Factor, a value between 0 and 1, is a measure of the potential effectiveness of the control.

Water quality credit for the VFS BMPDF variable will be calculated as:

If the hydraulic loading rate (HLR) for the peak flowrate for the 2-year, 3-hour rainfall event is ≤ 0.05 cfs/ft. width:

$$\text{BMPDF} = A_{\text{vfs}}/A_{\text{ecm}}$$

If the hydraulic loading rate (HLR) for the peak flowrate for the 2-year, 3-hour rainfall event is > 0.05 cfs/ft. width:

$$\text{BMPDF} = (A_{\text{vfs}}/A_{\text{ecm}}) * (\text{HLR}_{\text{ecm}}/\text{HLR}_{\text{vfs}})$$

- Where A_{vfs} is the area of the proposed vegetative filter strip in acres
- A_{ecm} is the area in acres of a vegetated filter strip that would be required per section ECM 1.6.7B.
- HLR_{vfs} is the hydraulic loading rate (flowrate/width) of the proposed vegetative filter strip, in cfs/ft.
- HLR_{ecm} is the 0.05 cfs/ft. width hydraulic loading rate criterion from section 1.6.7.B. of the ECM.
- HLR values greater than 0.15 cfs/ft. width are not permitted.

A maximum value of 1 is allowed for the BMPDF factor, even if the proposed VFS is larger than required by the ECM, or if the HLR is lower than required by the ECM.

Example:

A 5 acre commercial site with 80% impervious cover (4 impervious acres) is required to provide on-site water quality treatment. It is proposed to route 1 acre of parking lot (100% impervious cover) to a 0.75-acre vegetative filter strip (VFS), with dimensions 350 feet wide by 93 feet long. Without the VFS the water quality volume required is 1.10", or 19,965 ft³. What water quality credit can be applied to this site?

As the parking lot area to be treated is 1 acre, and the total site impervious cover is 4 acres; the IAF value is $1/4 = 0.25$.

For determining the BMPDF value, first look in section 1.6.7B of the ECM; a vegetative filter strip sized to treat a 1 acre parking lot at 100% impervious cover would have to be ≥ 2.49 acres in size. The proposed VFS is 0.75-acre. Next calculate the peak flow rate for the 2-year, 3-hour rainfall event, then determine if the proposed HLR is ≤ 0.05 cfs/ft. width. In this case this criteria is met, thus:

$$\text{BMPDF} = (0.75/2.49) * 1 = 0.301$$

Inserting the values into the water quality credit equation:

$$\text{WQC} = \text{IAF} * \text{BMPDF} = 0.25 * 0.301 = 0.075$$

The vegetative filter strip reduces the required WQV by 1,503 ft³, or to 18,462 ft³.

4. **Signage.** Should be provided to delineate the boundaries of the filter strip, and to notify residents, inspection, and maintenance staff of its function and proper management per ECM 1.6.7(B).

5. **Maintenance.** Filter strips shall be managed so that a dense, healthy vegetative cover is preserved. Once established, filter strips using native grasses shall be maintained without pesticides and fertilizers. Turfgrass filter strips may be managed with a minimal amount of irrigation and fertilization (not more than 1 lb. of nitrogen per 1,000 square feet per year) however no herbicides or pesticides shall be applied.

Bare spots and areas of erosion identified during inspections must be replanted and restored to meet specification. If sediment accumulates on the vegetative filter strip then it must be removed. Any disturbance to the filter strip as a result of maintenance procedures (or other reasons) shall be repaired, including re-establishment of the vegetation.

An approved Integrated Pest Management Plan with a recorded Restrictive covenant is required. It is extremely important that the VFS not be over-irrigated and that fertilizer and chemical use be minimized; otherwise the VFS may become a source of pollution instead of a treatment BMP.

G. **Non-Required Vegetation**

1. **Introduction.** Additional non-required vegetation, especially trees, can help reduce stormwater runoff and enhance ground water recharge by breaking the impact of raindrops and improving soil structure. A tree's effectiveness in this capacity is correlated with the size of the crown and root zone area. There are numerous environmental and stormwater benefits to additional vegetation. Non-required vegetation can act as natural stormwater management area by filtering particulate matter, including pollutants, some nutrients, sediments, and pesticides, and by absorbing water. A study done by the U.S. Department of Agriculture's Center for Urban Forest Research found that a medium-sized tree can intercept 2,380 gallons of rain per year (Center for Urban Forest Research 2002). A factor that can reduce the life and health of trees in urban areas, and thus their effectiveness, is compaction of or pavement over root systems. The criteria below are designed to protect the root system.

Non-required vegetation is eligible for water quality credit except in watersheds within the Barton Springs Zone and Contributing Barton Springs Zone.

2. Water Quality Credit and Design Guidelines

Non-required vegetation is eligible for water quality credit, in terms of pervious area (impervious area reduction), if the criteria below is met.

The following factors affect non-required vegetation Water Quality credit:

- The available planting area, see ECM 3.5.0;
- The anticipated rate of survival of vegetation planted;
- The quantity of vegetation to be planted; and
- The types of vegetation proposed.

The vegetation area eligible for credit is the 25-year growth root system. For trees, the root system is assumed to be equal to the canopy cover. To be eligible for credit the entire spatial area of the 25-year root system must be pervious (landscape and/or pedestrian-only porous pavement).

Direct rainfall is assumed to be the primary source of stormwater and no off-site runoff is allowed.

Minimum soil depths of twelve (12) inches for new trees and eight (8) inches for plants and grasses will be required. For the soil media requirements use the biofiltration media specifications shown in Environmental Criteria Manual (ECM) 1.6.7(C) Biofiltration.

For Non-required vegetation where porous pavement is used above the root zone the design criteria for porous pavement should be followed, see ECM 1.6.7(E).

Note: No Water Quality credit will be given for the 25-year growth root system of non-required vegetation located within vehicular parking areas. Additionally, porous pavement is not allowed under stormwater hot spots or areas where land use or activities generate highly contaminated runoff as described in ECM 1.6.7(E).

3. Maintenance. An approved Integrated Pest Management Plan with a recorded Restrictive covenant is required. It is extremely important that fertilizer and chemical use be minimized; otherwise the Non-required vegetation may become a source of pollution instead of a treatment best management practice. Tree Pruning and vegetation management should be modified (i.e., less frequent and less intensive) to maximize the leaf surface area, or Leaf Area Index (LAI), the 25-year growth root system, and the rainfall interception rate to increase future benefits.

References:

1. USDA Forest Service, PSW, Center for Urban Forest Research, Rainfall Interception by Santa Monica's Municipal Urban Forest, September 2003

H. Rain Garden.

1. Introduction. A rain garden is a filtration and/or infiltration system that has a contributing drainage area not to exceed 1.0 (one) acre, and a ponding depth not to exceed 6 (six) inches. Unlike conventional centralized stormwater management systems, the rain garden approach may employ multiple controls dispersed across a development, and incorporated into the landscape, providing aesthetic as well as ecological benefits. The purpose of this section is to provide guidance on assigning water quality credit for rain gardens smaller than those meeting the criteria provided in the Environmental Criteria Manual (ECM) Section 1.6.7(C), Biofiltration. Other than what is specifically mentioned in this section, all other design, construction, landscape, inspection, and maintenance criteria provided in ECM 1.6.7(C) must be met.

A Rain Garden can provide partial treatment equivalent to a standard sedimentation/filtration system but is not acceptable as a primary method for controlling non-point source pollution in watersheds within the Barton Springs Zone and Contributing Barton Springs Zone. The use of a Rain Garden as a water quality control is limited to Commercial and Multi-Family developments only.

As with sand and biofiltration systems, a rain garden will provide physical filtration of pollutants in stormwater runoff. However, because of the small drainage area and shallow ponding depth, which necessitate a larger surface area, biological and plant uptake mechanisms may be more significant for rain gardens. In addition, rain gardens may receive lower sediment loads than other systems, and this can also potentially enhance their pollutant removal performance, and prolong operational life.

On the negative side, if rain gardens are over-irrigated and receive significant applications of fertilizers and herbicides, they can become sources of pollution rather than pollutant removal BMPs. Thus, it is essential that these rain garden systems be managed carefully and that an approved and recorded Integrated Pest Management plan be required for the drainage area up to and including the rain garden.

Like all filtration systems in the City of Austin, isolation of the Water Quality volume and the minimization of mixing of additional flows are necessary, as is pre-treatment in order to protect the filtration media from sediment loads. Pre-treatment can be provided by a sediment chamber, analogous to a "partial" sedimentation-filtration system.

2. Surface Area.

The total area of the system is the sum of the filtration and sediment chamber areas.

A Darcy's Law approach is used to determine the minimum filtration area required:

$$Q = k * i * A_f$$

- Where Q is the treatment rate of the BMP
- k is the saturated hydraulic conductivity
- i is the hydraulic gradient
- A_f is the filtration media surface area

Because of the shallow ponding depth it is reasonable to set the hydraulic gradient i to a value of 1.0:

$$Q = k A_f$$

By definition:

$$Q = WQV/DDT$$

- Where WQV is the water quality volume
- DDT is the drawdown time; 48 hours is used

Setting the two equations equal and solving for A:

$$A_f = WQV/(k * DDT)$$

Pending local monitoring data a k value of 3.5 ft/day is recommended for filtration media. If an infiltration system is proposed the saturated hydraulic conductivity of the soil must be determined. If a range of values are available then the lowest value should be used. For design purposes, the soil conductivity value should be reduced by at least a factor of safety of 2 to account for potential clogging over time.

Assuming a filtration system with 3.5 ft/day hydraulic conductivity, and a 48 hour drawdown time gives:

$$A_f = WQV/7$$

- Where A_f is the minimum required filtration media surface area in ft²
- WQV is in ft³

Because of significant uncertainties as to the actual k value over the life of the rain garden, the underdrain system is to have an orifice installed that is sized to provide a 48 hour drawdown time.

The sediment chamber area is the total area minus the filtration area; this area should be determined after accounting for the water quality volume held in and above the filtration media (see design example below).

3. Water Quality Volume.

The water quality volume is the combined volume of the filtration and the sedimentation chamber areas. The sediment chamber must hold at least 20% of the water quality volume. Due to the small drainage area and large surface area of these systems, the filtration media should be protected better against sedimentation than typical filtration systems. Because of this water quality volume credit will be allowed for 80% of the effective porosity volume of the filtration media. or:

$$\text{WOV} = \text{WOV}_{ne} + \text{WOV}_{ponded}$$

- Where WOV is the total water quality volume in ft³
- WOV_{ne} is 80% of the filtration media effective porosity volume
- WOV_{ponded} is the ponded volume, with a maximum ponding depth (H) of 6 inches

To calculate WOV_{ne} in ft³:

$$\text{WOV}_{ne} = 0.8 * A_f * L * n_e$$

- Where A_f is the surface area of the filtration media is ft²
- L is the depth of the filtration media, a minimum of 1.5 ft
- n_e is the effective porosity of the media. As a default assumption a value of 0.3 can be used.

Inserting the values and assumptions results in:

$$\text{WOV}_{ne} = 0.24 * A_f * L$$

- Where A_f is the surface area of the filtration media is ft²
- L is the depth of the filtration media in ft

The ponded water quality volume is then calculated as:

$$\text{WOV}_{ponded} = \text{WOV} - \text{WOV}_{ne}$$

Also WOV_{ponded} can be estimated as:

$$\text{WOV}_{ponded} = (A_f + A_{sed}) * H$$

The two equations can be combined and, setting H equal to 6 inches (0.5 feet), the sediment chamber area can be calculated:

$$A_{sed} = [2 * (\text{WOV} - \text{WOV}_{ne})] - A_f$$

Example

A 1 acre parking lot (100% impervious cover) proposes to use a rain garden for water quality treatment. Design the system using the criteria presented above.

The water quality volume (WQV) for a 100% impervious cover site is 1.30-inches, or 4,719 cu.ft. for a 1 acre site.

The proposed design will have a maximum ponding depth of 6 inches, and a media depth of 1.5 feet. The minimum required filtration area is:

$$A_f = WQV/7 = 4719/7 = 674 \text{ sq.ft.}$$

The designer proposes 700 sq.ft. of filtration area.

The WQV assigned to the filtration media effective porosity void space is:

$$WQV_{ne} = 0.24 * A_f * L = 0.24 * 700 * 1.5 = 252 \text{ cu.ft.}$$

The ponded WQV is estimated as:

$$WQV_{ponded} = WQV - WQV_{ne} = 4719 - 252 = 4,467 \text{ cu.ft.}$$

The sediment chamber area can be estimated as:

$$A_{sed} = [2 * (WQV - WQV_{ne})] - A_f = [2 * (4719 - 252)] - 700 = 8,234 \text{ sq.ft.}$$

The sediment chamber area must be at least 20% of the total area, or $WQV/H * 0.2 = 4719/0.5 * 0.2 = 1888 \text{ sq.ft.}$ As 8,234 is greater than 1,888 the design is acceptable.

APPENDIX R-11 RAIN GARDEN CALCULATIONS FOR DEVELOPMENT PERMITS

DRAINAGE AREA DATA:

	Required	Provided
Drainage Area to Control (DA \leq 1.0 acre)		
Drainage Area Impervious Cover	ac.	
Capture Depth (CD)	%	
Water Quality Volume (WQV = CD * DA * 3630)	in.	
	cf	cf

WATER QUALITY CONTROL CALCULATIONS:

	Required	Provided
The Water Quality Control is to be RAIN GARDEN		
100-year Peak Flow Rate to Control (Q100)	cfs.	
Filtration Pond Area ($A_f = WQV / 7$)	sf	sf
Depth of Filtration Media (L)	≥ 1.5	ft.
Effective Porosity Water Quality Volume ($WQV_{ne} = 0.24 * A_f * L$)		cf
Ponded Water Quality Volume ($WQV_{ponded} = WQV - WQV_{ne}$)		cf
Sedimentation Pond Area ($A_{sed} = [2 * (WQV - WQV_{ne})] - A_p$)	$\geq 20\%$ of WQ Pond Area	sf
Rain Garden Pond Drawdown Time	≥ 48	hr.
Underdrain Orifice Size (diameter)		in.
Underdrain Orifice Size (area)		sq. in.
Water Quality Elevation (WQE)		ft. msl.
Elevation of Splitter/Overflow Weir	$> WQE$	ft. msl.
Length of Splitter Weir		ft.
Required Head to Pass Q100	≤ 0.5 ft.	ft.
Pond Freeboard Provided to Pass Q100	> 0.25 ft.	ft.

Dastpanu's
name.
5/2/07

Environmental Board

May 2, 2007

6:00 P.M.

Applicant Lisa Harris and Bruce Elfant
Address 4522 Avenue F
City Staff Michael Embesi

Issue

The applicant has requested to remove two protected size trees to qualify for an Austin Energy rebate program. This request was denied by the City Arborist based upon the Land Development Code's tree preservation criteria. The applicant has appealed the City Arborist's decision not to allow the trees to be removed.

Attachments

- Tree Ordinance Review Application (with photographs)
- Tree and Natural Area Protection Ordinance
- Austin Energy Solar Rebate Program
- Hyde Park Neighborhood Plan



City of Austin www.cityofaustin.org

**Watershed Protection and Development Review Dept.
Land Use Review**
505 Barton Springs Road 4th Floor
Austin, TX 78704

Michael Embesi, City Arborist
Environmental Review Specialist Senior

(512) 974-1876 Fax (512) 974-3010
Pager (512) 802-3637
michael.embesi@ci.austin.tx.us



Tree Ordinance Review Application

City of Austin

Founded by Congress, Republic of Texas, 1839
Watershed Protection and Development Review Department
One Texas Center, 505 Barton Springs Road
P.O. Box 1088, Austin, Texas 78767
Phone: (512) 974-1876 Fax: (512) 974-3010

Paid: Yes/No _____
Receipt Number: _____
Inspection Date: _____ November 2005

This application requests¹ (specify all that apply):

- removal of a protected-size tree; 2 trees
- development exceeding allowable standards for encroachment in the critical root zone²;
- removal of more than 30% of a tree's crown².

¹ Additional tree information may be obtained from the Land Development Code (25-8), Environmental Criteria Manual (Section 3), or the City of Austin Urban Forestry web page (<http://www.ci.austin.tx.us/trees/>).

² Applicant understands that encroachment in the critical root zone, or removal of canopy, may threaten the health of the tree and that approval of this application does not guarantee the continued health of the tree.

Please attach an aerial drawing that includes the location of the tree, proposed development, and utilities. The application and payment (check to the City of Austin for \$25 per tree) can be mailed or delivered to the above addresses. Payment must be made prior to City personnel completing this application. If relevant, check and initial the following box to indicate that the fee is to be applied to the building permit (i.e. escrow payment).

Address of Property (including zip code): 4522 Avenue F, Austin, TX 78751

Name(s) of Owner and Applicant: Lisa Harris + Bruce Elfant

Building Permit Number (if applicable): _____

Telephone Number: (512) 467-2504 Fax Number: (512) 476-1706 (credit fax)

Type of Tree: pecan (both) Location on Lot: in front by street

Trunk Circumference (inches around) at 4 1/2 Feet Above Ground: 80 1/2" + 75 3/4" 719"

General Condition: fair

Reason for Request: to qualify for solar rebate program

Lisa Harris 2-12-07
Owner/Applicant Signature Date

TO BE COMPLETED BY CITY ARBORIST

Approved | *Approved With Conditions | Denied | Statutory Denial (more information required)

Comments: 1) PROVIDE DOCUMENTATION SUPPORTING TREE REMOVAL REQUEST AS IT PERTAINS TO SOLAR REBATE PROGRAM 2) IF IMPACTING THESE TREES IS STEW DESIRED, SUBMIT PRUNING PLAN FROM A CERTIFIED ARBORIST

*Conditions of Approval: None; As described within Arborist Comments (see above); and/or, To

Applicant agrees to plant _____ caliper inches, container grown, City of Austin Class 1 trees (i.e. Live Oak, Cedar Elm, Mountain Laurel) on the lot prior to obtaining a Certificate of Occupancy (trees are to be a minimum of two inches in caliper width). Prior to development, applicant agrees to supply a root zone mulch layer and maintain tree protection fencing (chain-link, five-foot in height) providing the utmost root zone protection.

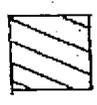
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Owner/Applicant Signature Date City Arborist Signature Date

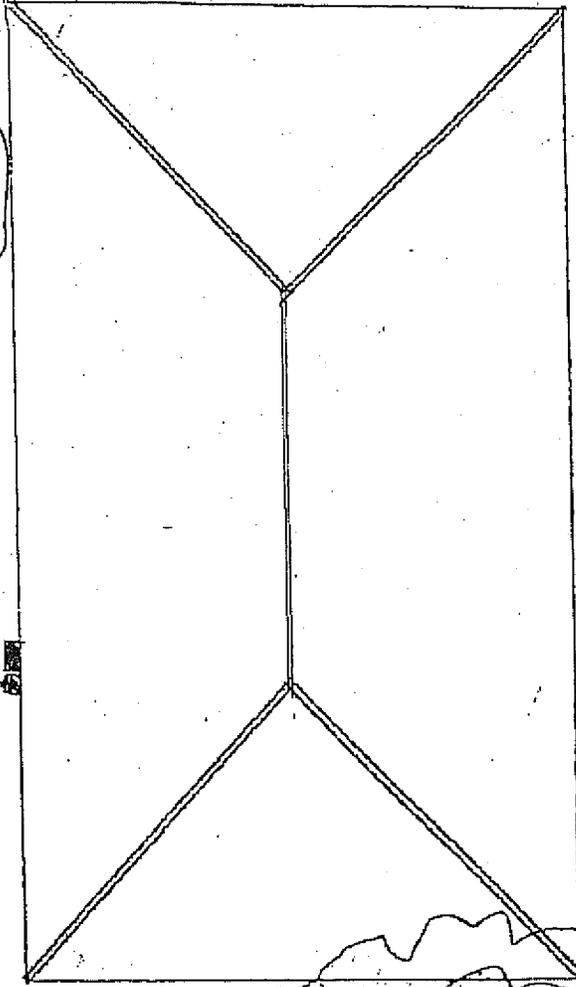
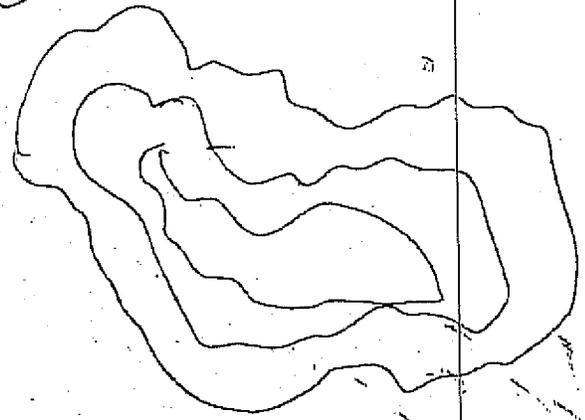
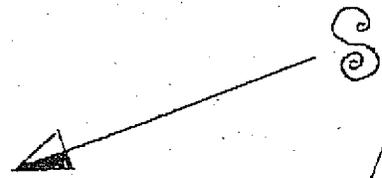
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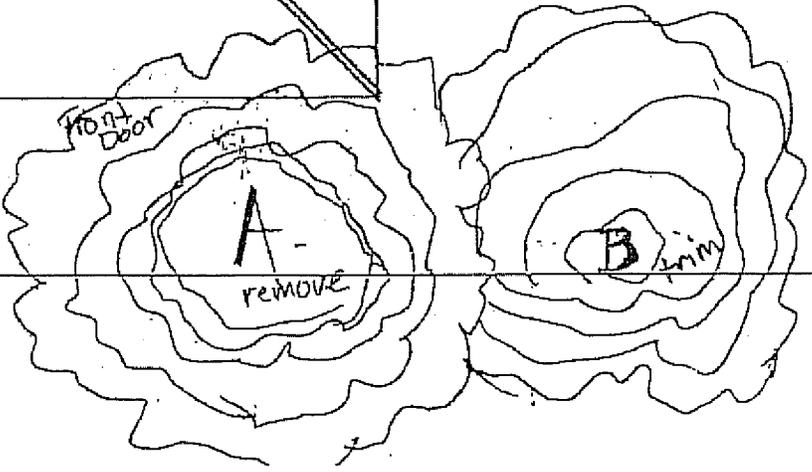
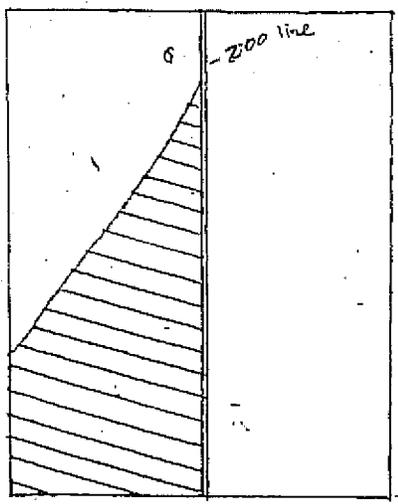
~~2.5~~ 2.5 kW conditional

Site Diagram Showing:
 Bldg Plan
 Orientation
 Roof Slopes
 Solar Obstructions
 Likely Location for PV
 (Elec. Service Entrance)

 = 210 @ 25° tilt



electrical service



June 2006

2



Ref. # R1377

Solar PV Rebate Program Preliminary Site Assessment Form

Customer Name	<u>Bruce Elfant + Lisa Harris</u>		
Address	<u>4522 Ave F</u>	Account #	<u>5211079</u>
City, State, Zip	<u>Austin TX 78751</u>	Phone #	<u>467-2504</u>
AE Inspector	<u>T. Hanky</u>	Date	<u>1-26-07</u>

Deed Restriction? Yes No Doesn't Know
Is Applicant Home/Building Owner? Yes No

Building:
Type: Residential SF Residential MF Commercial
Sq. Ft. 1800

Roof Section for PV Array:
Orientation: 210° Approx. Pitch: 25° Approx. Area: 300 f²
Shading: leaves Roof Type: Shingle Roof Condition: new
Height: 15' 0" Wall Const: Wood

Initial Inspection Result:
 Yes, site qualifies for rebate
 If yes, potential system size (kW) 2.5 kW
 Conditional, site may qualify for rebate if conditions are met (see below)
 No, site does not qualify for rebate

Conditions (if applicable): Panel upgrade - Remove tree "A" from tree "B" to 8:00am

Additional Recommendations:
